The American School and University

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

1938

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Foreword

By JOHN H. FINLEY

Editor, *The New York Times;* former State Commissioner of Education, New York

OUT in a little box of a schoolhouse on the prairies more than fifty years ago, we used to recite as a declamation the piece beginning, as I recall it across the half-century: "Not many generations ago where we now sit encircled by all the embellishments of life, the wild fox dug his hole unscared and the Indian hunter pursued the panting deer." We did not know what the embellishments of life were (we did not have a dictionary to tell us), but the context allowed us to think that they were the best things of life. As I look through this sumptuous volume on the American school, college and university, I am impressed by the provision that is being planned so widely for the children and youth of the oncoming generations. Since that time America has learned what embellishments are. They have become a part of the very necessities of life for millions.

IN flying across the continent, I have been especially impressed by what is being done by way of "encircling" children and youth with school buildings and playgrounds, even in crowded cities. There are still the little one-room schools out in the country, even in the East. I have visited scores, hundreds, of them myself. But the consolidated school is beginning to bring even to the sparsely settled districts the higher educational advantages such as those who live in the cities enjoy as well as those that nature has to offer in the rural areas. Taking the United States over, one-half of the boys and girls of high-school age are now in high school. This is the most significant fact in the history of education. It gives us our best foundation and hope for democracy.

WITH that advance in the level of public education, such provision in the way of buildings and equipment becomes an essential, not only for school use but as community centers—as H. G. Wells prophesies. And with this rise in high-school attendance more and more young men and young women go on into the still higher ranges. Never before has there been in the history of man such a pressing forward and upward on the part of young people in desire and effort for cultural and vocational training. This yearbook gives the most hopeful intimation of what can be done physically to help teachers in their task, which is supreme in a democracy. In some measure, and it is hoped in great measure, it is a prophecy of the school of tomorrow.

I HAVE recently had part in the rededication of the central building of my Alma Mater (Knox College in Galesburg, Ill.). It was the first building of architectural beauty and impressiveness that I ever saw. Its very lines have been an inspiring part of the tuitions and traditions of the college. Its walls, which have had historic associations, have been repaired and strengthened for a new century and its rooms made glorious within—adorned for teachers, students and alumni with highest simplest beauty. We cannot all have the unique pleasure that President Johnson of Colby College is having in laying out a new campus, but we should "embellish" our inherited campuses with what science and the arts have to offer.

THIS book should be within reach of every school, college and university board having to do with the design, construction, equipment, utilization and maintenance of educational buildings and grounds, for these are educational essentials—and not alone "embellishments."

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SECTION I
THE BUILDING PROGRAM

THE DEVELOPMENT OF COMPREHENSIVE BUILDING PROGRAMS FOR CITY SCHOOL SYSTEMS

By N. L. ENGELHARDT

Professor of Education, Teachers College, Columbia University

EVERY school building erected in a city should be a part of a comprehensive school-building program. Every school-building program should be definitely related to an intelligently developed and approved city plan. The school-building program and the city plan of every community should be well coordinated with similar planning in the contiguous governmental districts. Only in this way can the proper developments of regional areas be assured, and building beyond regional needs be prevented. The coordination of such planning among adjacent communities should assist significantly in the reduction of costs and in the subsequent tax needs. Regional cooperation in planning leads ultimately, as it should, to state-wide planning and development of resources as well as of facilities for human use.

Volumes on city planning as well as city plans themselves have multiplied rapidly within the past two decades. This literature has not stressed school-building needs sufficiently. Too little attention has been given to the adequate size of sites, the location of sites, the routing of traffic to prevent accidents about school buildings, and the relationship of schools to the residential areas which they serve. In these city plans the school has frequently been thought of as an incidental rather than as a major feature, and little appreciation has been shown of the need for a high degree of coordination between parks, playgrounds, schools, and general housing. School-building surveys have also come from the press in considerable numbers within recent years. These studies have neglected to stress adequately the importance of the relationship of school-plant development to all other aspects of community development.

City Planning Should Include School-Plant Planning

The aims of the city planner and the school-plant planner are very similar. They both desire communities in which every advantage has been taken of natural contours and natural beauties to make the city attractive. They desire freedom from noise, traffic dangers, and other disagreeable features. They want to build a city in which individuals can live happy, constructive lives in a milieu which offers every advantage for social, economic, and intellectual growth. They seek the development of every worthwhile agency,—the schools, the museums, the libraries, the parks, and the playgrounds,—to the end that they may serve the large majority of the citizens. They stress the interrelationship of industry and commerce with the social and intellectual growth of the citizenry. These workers hope to develop communities which have permanence, enduring attractiveness, and a high degree of serviceability to meet the wants of man. There must be more of understanding between city planners and the educational systems of our country. City planning commissions must learn to appreciate what the schools are doing and still hope to do. The school authorities must be able to conceive of their problems in relationship to all the constructive needs of the community.

For the advancement of the school-building program, city planning commissions, or zoning groups, can provide much assistance. Maps on zoning, on proposed programs of street developments, on grade separations, bridge connections, and traffic detours, carry invaluable information for the school-plant program. In fact, it is difficult to conceive how many of these maps can be prepared without a full appreciation of what the present and future school-plant needs are, where sites should be located, and how these sites will be used for school as well as general community purposes.

A traffic hazard and accident map prepared by the Hartford school administration as part of its study of city problems is shown in Diagram 1. The dots on

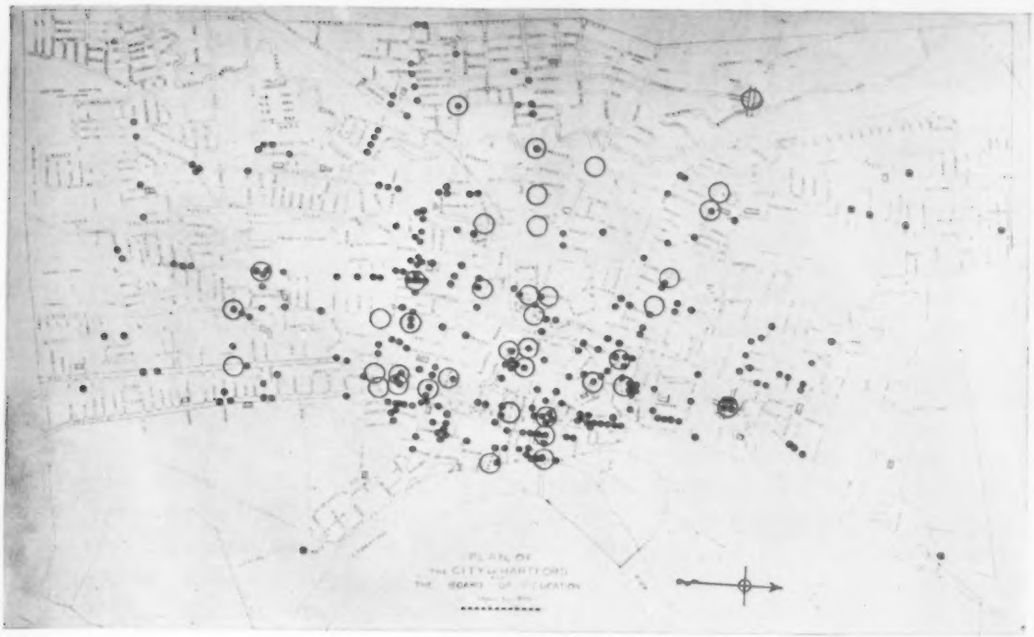


Diagram 1—The dots on this map indicate traffic accidents to children in Hartford, Conn. The circles represent street intersections with major hazards. The school authorities have been utilizing facts like these to route the children back and forth to school. Continued studies of this kind should be used as the basis for assisting in the actual location of buildings and in the reduction of accidents. More adequate playground areas about each school, with a program of use after school hours as well as during the school day, should assist significantly in reducing the great number of school children involved in accidents

this map indicate traffic accidents to children. The circles represent street intersections with major hazards. City planning must certainly take cognizance of this type of information. It suggests the need for more adequate playgrounds, more extensive use of them after the school-day, and perhaps the actual inclusion in the school staff of officers whose sole duty is that of traffic control for school children.

Land-use maps, like that of Hartford shown in Diagram 2, should be made periodically in every city. The permanent continuing record of community development should include a series of maps like this one, as well as other maps showing housing and changes in population. It is quite clear that such factual evidence as this will assist in forming the only constructive basis upon which to advance school-building needs.

It is possible that much school-plant planning of

Diagram 2—Land-use map of Hartford, 1936. Black areas show commercial and industrial regions and cemeteries. Cross-hatched areas show parks, hospitals and college grounds. The small dashes represent the homes of the people, some single-family homes and others multiple-family dwellings. The white areas represent open territory used only for farm purposes or lying idle. The small dot-centered circles represent the present-day public schools

the past has been basically faulty. The school buildings have been placed where the population exists. Frequently the housing for this population has not been planned, congestion has resulted, slums have appeared after the homes have become obsolescent, and a more or less permanent sore-spot has been created in the city. Both city and school planners should consider whether it is not more desirable to plan schools on the following principle: Select adequate sites and place buildings where the population ought to be, and have the residential growth come to the school area rather than have the school taken to a blighted residential area. The pursuance of this principle will certainly enhance community values. The placement of a school in a blighted area requires the demolition of antiquated and congested housing, and the rebuilding of both school and housing from the ground up. Such a process will of course be necessary in many sections of our cities which have grown without planning and without primary consideration of human needs.

Importance of Estimating Population Trends

Population trends in the various areas of the community offer much enlightenment in the development of the school-building program. There is always difficulty in securing adequate data on trends. The United States enumeration districts are one source of information. Unfortunately, the United States Census has not kept the boundaries of the enumeration districts uniform through the various census periods. When comparisons over three or four decades are desired, a gerrymandered map like that of Diagram 3 results. This map of Hartford shows wide variations in increases among the eight districts. The increases are stimulated in large degree by unregulated subdivisions in which little consideration has been given to the ultimate city beautiful. It is even conceivable that the realtor who wishes to subdivide an area will gain more financially in the long run if his plans are built upon a better understanding of what constitutes desirable school-plant and community planning. Irresponsible subdividers of land, who concentrate upon their profit rather than upon the substantial and attractive character of the homes built, have multiplied beyond any reasonable right the problems of city planning and attendant costs.

Estimating population growth presents many difficulties, but such estimates must be made if a future plan is to be projected. Engelhardt and Engelhardt in their book on "Planning School Building Programs" decry mere "booster" methods. They present the following as the preferred measures of economic change which reflect population change: assessed valuations, bank clearings, bank deposits, value of building permits, changes in railroad commuters, postal receipts, telephone service stations, gas meters, sewer extensions, water meters, electric meters, and building permits.[1] These factors cannot be taken separately but must be continually associated. The school-planning department of a board of education should have continuing records of changes involving these data.

1 Engelhardt, N. L., and Engelhardt, Fred: "Planning School Building Programs," p. 56. Bureau of Publications, Teachers College, Columbia University, 1930.

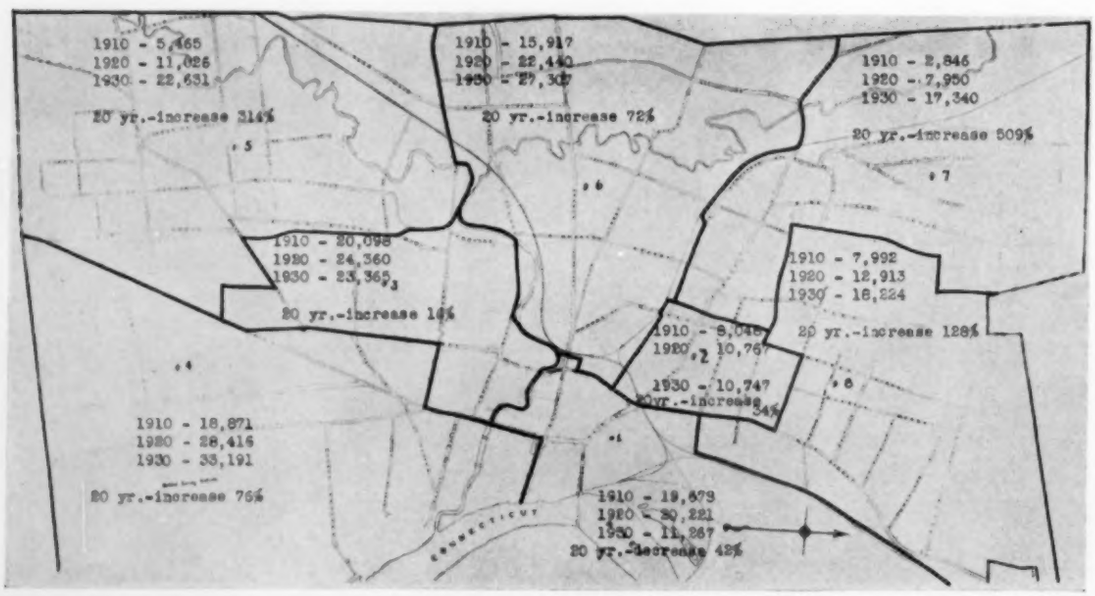


Diagram 3—Survey districts used in the population study of Hartford, Conn. These districts were formed from districts used in various previous population studies. The figures indicate the population changes which have taken place in these districts from 1910 to 1930

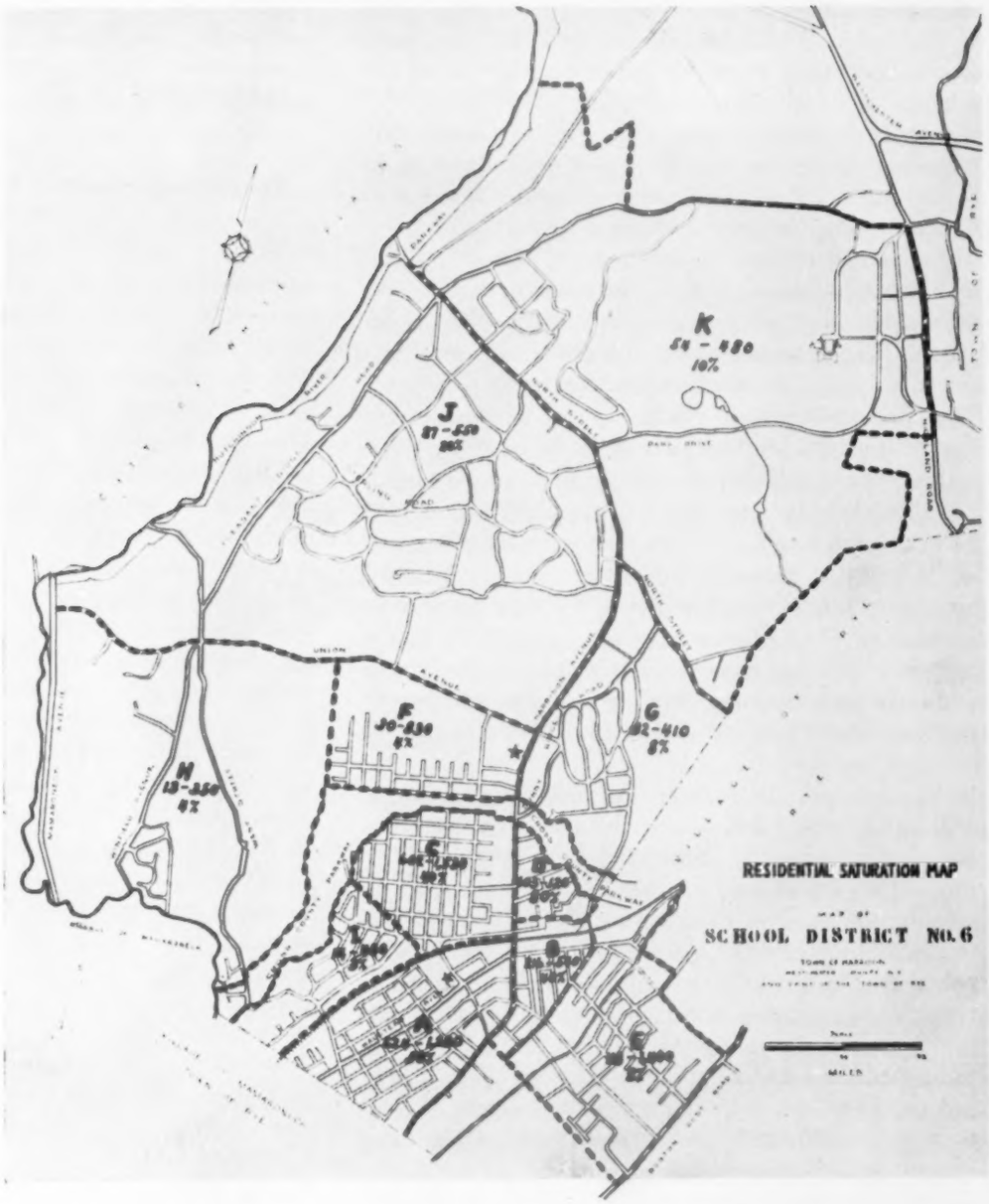


Diagram 4 — Residential saturation map, Harrison, N. Y. The district has been divided into 11 different residential areas. The first figure in each district represents the present number of homes. If the same type of development continues as now appears in each district, the maximum number of homes possible in each district is indicated by the second figure. This maximum, no doubt, will probably not be reached in any district

The school authorities should become familiar with the degree of residential saturation in all its areas. New school buildings are rarely needed in fairly well-saturated areas unless replacement is necessary. Diagram 4 shows the residential saturation map for School District No. 6, Harrison, N. Y. The district has been divided into eleven different residential areas. The first figure in each district represents the present number of homes. If the same type of development continues that now appears in each district, the maximum number of homes possible in each district is that indicated by the second figure. This maximum, no doubt, will probably not be reached in any district. Boards of education can, however, be more intelligent about their building plans if the present as well as the possible housing of all areas is known.

The Basic Community Needs and Aspirations

School administrative authorities cannot develop a school plant without having adopted definite educational policies. These policies should grow out of a common philosophy of community life, of curriculum development and of community educational aspirations. The underlying philosophy will affect the size of site, the use to which it is put, the general character of the building, the nature of its contents, and the degree to which the facilities are utilized for the common good. Continuing studies of school population, enrolment and attendance by grades and geographic areas are recorded as a matter of course in a good school administrative office. There must be records of the appraisal of plant facilities. A policy with respect to size of building for each type of school

should have been discussed and settled. The details of the financial program should be clearly at hand. Dot or spot maps of public and non-public school enrolment are made frequently, and the trends offer assistance in plant development. School census data, including pre-school as well as post-school groups up to the age of 21, are also recorded in such manner as to make possible pertinent regional interpretations. Many school systems today show a decline of elementary population, a rapid increase in high-school population, and an increase in the pre-school age group. The meaning of these trends must be determined as a school-plant program is being developed. The changes that take place in these trends must be known if school buildings are to be built to meet real rather than imaginary needs.

The school-plant appraisal is not a cursory task to be performed hastily. The appraisal should be made in the light of changing educational needs. Existing conditions should be compared with changing building standards. The classroom which sufficed 30 years ago may not be considered adequate today. The auditorium planned for casual school and community meetings should be rated in terms of today's rapid expansion of the dramatic, speech and musical arts. In like manner, all the other facilities of a school, as well as the construction, must be thought of in terms of today's standards. No school building has eternal life. The school building should be considered as meeting the needs of special groups at a special period in community growth. As new concepts develop and new demands arise, there should be little hesitation in changing the school plant to meet the need; hence, detailed appraisal is essential if educational progress is to be made in a community.[2]

As a new school-building need looms in a community, considerable activity should be initiated among the school staff to assure adequate consideration of what the contents and facilities of the building must be. Every school building must be planned to meet the specific needs of the group which it will serve. If this principle were followed, probably no two school buildings would be alike. The teaching staff and the administrative staff should cooperate in setting up a very comprehensive statement of educational need. Such a statement of need should state the basic philosophy, the nature of the curriculum, the teaching methods to be followed, the kinds of spaces needed, the relationship of such spaces to one another, and the equipment that is desired. Suggestive room layouts should accompany the statement, so that the architectural service may have a thorough appreciation of what the community desires in the way of a school plant.

The School Building's Effect on Community and Individuals

The erection of a school building cannot be undertaken lightly. It represents a major investment of taxpayers' money. Its use will affect the lives of hundreds of individuals over decades. Its character will determine in part the very nature of the educational program. The building and the work that goes on therein will have untold effect upon community living and community growth. In many communities the school building and its associated program bring in new enthusiastic residents. In other communities, a school building and what goes on therein drive away the citizen and his family who had hoped for something better.

Hundreds of thousands of dollars of school-building money are spent yearly without much attention to many of the points presented above. An architect is engaged. He is instructed to build a schoolhouse. He serves as best he can under the limited vision and guidance of the school authorities. Such a procedure, in the long run, is not satisfactory to any of the individuals involved. The city planner, school-board member, school superintendent, teacher, architect, engineer, and contractor should all be expected to acquire a broad over-view of the services they are expected to render when a school building is to be built. There is no step of the program for which principles have not been elucidated and standards have not been developed. The degree of success associated with the development of the school building can be measured by the degree to which the school authorities and associated workers have participated in building the groundwork.[3] The underlying principle that should guide throughout the entire process is that mankind is entitled to conditions of living which will make his intellectual, social, and economic growth possible. Man's children must be started right. They must be given the opportunity for an all-round development. Children's lives, regardless of the families from which they come, must be satisfying in content, in aspiration, and in growth. The city environment, the school site, and the character of the school building can in large measure make or break a child's chances for happiness and achievement.

2 For making a complete analysis of elementary school buildings, the "Elementary School Building Score Card and Survey Manual," by N. L. Engelhardt, will be of assistance. The "Survey Field Book for the Analysis of a High School Building," by N. L. Engelhardt, will also be helpful. These are published by the Bureau of Publications, Teachers College, Columbia University.

3 For checking on the building program, see the "Survey Manual for the Business Administration in Public School Systems," by N. L. Engelhardt and Fred Engelhardt. Published by the Bureau of Publications, Teachers College, Columbia University.

SOME FACTORS INVOLVED IN PLANNING A NEW COLLEGE CAMPUS

By FRANKLIN W. JOHNSON

President, Colby College

MANY interesting problems are involved in the opportunity facing Colby College—the re-thinking and re-planning of its physical plant. That this is an opportunity rarely given to any of the older educational institutions will be apparent when one considers the surprising fact that even the most illustrious and wealthy of American colleges and universities do not enjoy the advantages of carefully planned and laid-out facilities which any modern factory, or even a modern high school, is expected to possess. Individual buildings are often the last word in modern equipment, but their effectiveness is limited by lack of logical relationship to the adjacent buildings and by the fact that other buildings are inadequate and obsolete.

The reason is obvious. Almost all our colleges and universities which began more than fifty years ago were founded on a humble scale. The campuses were developed one building at a time, without the benefit of any comprehensive, long-range development plan. The college founders were not able to foresee the tremendous expansion in higher education, nor the increasing need of educational facilities and equipment, especially in the scientific branches.

As a consequence, the growth of the typical college campus has consisted in the erection of one new structure after another at varying intervals, designed and placed according to the ideas of a different president and a different architect each time. The inevitable result has been architectural chaos and, to a great degree, the sacrifice of educational efficiency.

Within recent years, new colleges have been founded with the benefit of good architectural direction and careful planning, but they have been limited by the uncertainty which surrounds any new venture, and usually have had to content themselves with a small-scale beginning.

Colby's Unusual Possibilities

The Colby project is different in that here we have an example of an old, well-established college moving into a completely pre-planned campus, carrying with it the prestige of 118 years of service and a rich background of traditions. There have been a few examples of an educational institution moving into new quarters, notably Duke University, Massachusetts Institute of Technology, University of Rochester, and Columbia University, but it will be observed that in each case the move was financed by some assured source of funds. Colby, on the other hand, decided to move and now is engaged in securing the necessary financial backing.

Briefly, the reasons for this unusual step lie in the physical situation in which Colby finds itself. Founded over a century ago on a pleasant wooded river bank a quarter of a mile from the village of Waterville, the growth of our industrial civilization has gradually been encroaching on the little campus, until the college is now hemmed in by railroad, freight yards, and the state highway on one side, and the river on the other. The unpleasant features of such a situation could be endured, but the utter impossibility of any program of new buildings and expansion makes the present location a critical handicap to any normal growth in the coming decades. It was this educational limitation which made the trustees, after years of careful consideration, decide that the only satisfactory solution would be to abandon the little campus in the heart of the city and build a new plant where there would be elbow-room for any predictable future. The decision was made in 1930.

The next step was to commission J. Fredrick Larson of Hanover, N. H., the official advisory architect for the Association of American Colleges, to draw up plans. Together with a faculty committee, he outlined the general specifications of a model liberal arts college of Colby's type.

It seems probable that with the increasing urbanization of the population of America in the coming years, more and more of a premium will be put upon a rural setting with its contact with nature and its freedom from the nerve-wracking artificiality of city life. Hence, the ideal environment for young people during their four years at college was conceived to be a campus in the middle of a park. The college community should be closely knit, but isolated from distractions by an area of natural terrain. Such a park, too, should be accessible to the home city by convenient approaches and have a connection with the state highway system.

Location and Architecture

All these considerations, plus unusual scenic beauty, were met by a location on a height of land known as Mayflower Hill overlooking Waterville and with a view embracing an expanse of Maine countryside to the distant blue mountains on three sides. Here 600 acres were purchased by the citizens of Waterville and presented to Colby as the site for the new college.

The next general decision to be made was in regard to the architectural style of the new building. The obvious answer was American Colonial, a style which is indigenous to New England and expressive of Colby's historical heritage. The materials to be used —red brick and white trim—can be largely procured locally, and the finished buildings, as vizualized in a setting of green lawns and elms, seem perfectly fitting for this college.

The Colby faculty at once began an exhaustive study of what the basic aims of a small liberal arts college were, and they attempted to forecast curriculum trends for the next fifty years. They then worked out what the fulfillment of these aims would require in terms of classrooms, laboratories, library facilities, equipment, housing and recreational facilities. These requirements were then submitted to Mr. Larson, who proceeded to develop the best possible arrangements of these buildings in relation to each other and to the topographical features of the site.

The result is what has been called a "functionally-planned" campus—a campus where the building arrangement has not simply been determined by a process of haphazard accretion, but thoughtfully worked out from every angle before the first spadeful of earth is turned.

The plans were made on the basis of accommodating a student body of 600 (Colby's present enrolment) at the beginning, with provision for a gradual increase to 1,000 some 20 years hence.

The Campus Plot Plan

The finished plot plan for the future campus shows the library to be the dominating building, with a lofty tower which will be a landmark for miles around. Flanking the green in front of the library are the academic buildings; those housing the sciences on one side and those for the humanities on the other. Each group consists of three buildings connected with colonnades to bind them into a single architectural unit, somewhat after the manner of the University of Virginia. The residence sections for the men and the women students occupy opposite ends of the campus. The chapel is placed slightly apart from the bustle of the campus traffic on a quiet spot higher up on the hillside, so that both actually and symbolically it will be on a higher plane. The administration building and the auditorium, both of which will be frequently visited by the public, are conveniently located at the two main entrances to the campus from the city road. The gymnasium and various playing fields are placed where the area is nearly level, and adjacent to the men's dormitories and fraternity houses. The stadium is placed with reference to the afternoon sun and to ample parking areas.

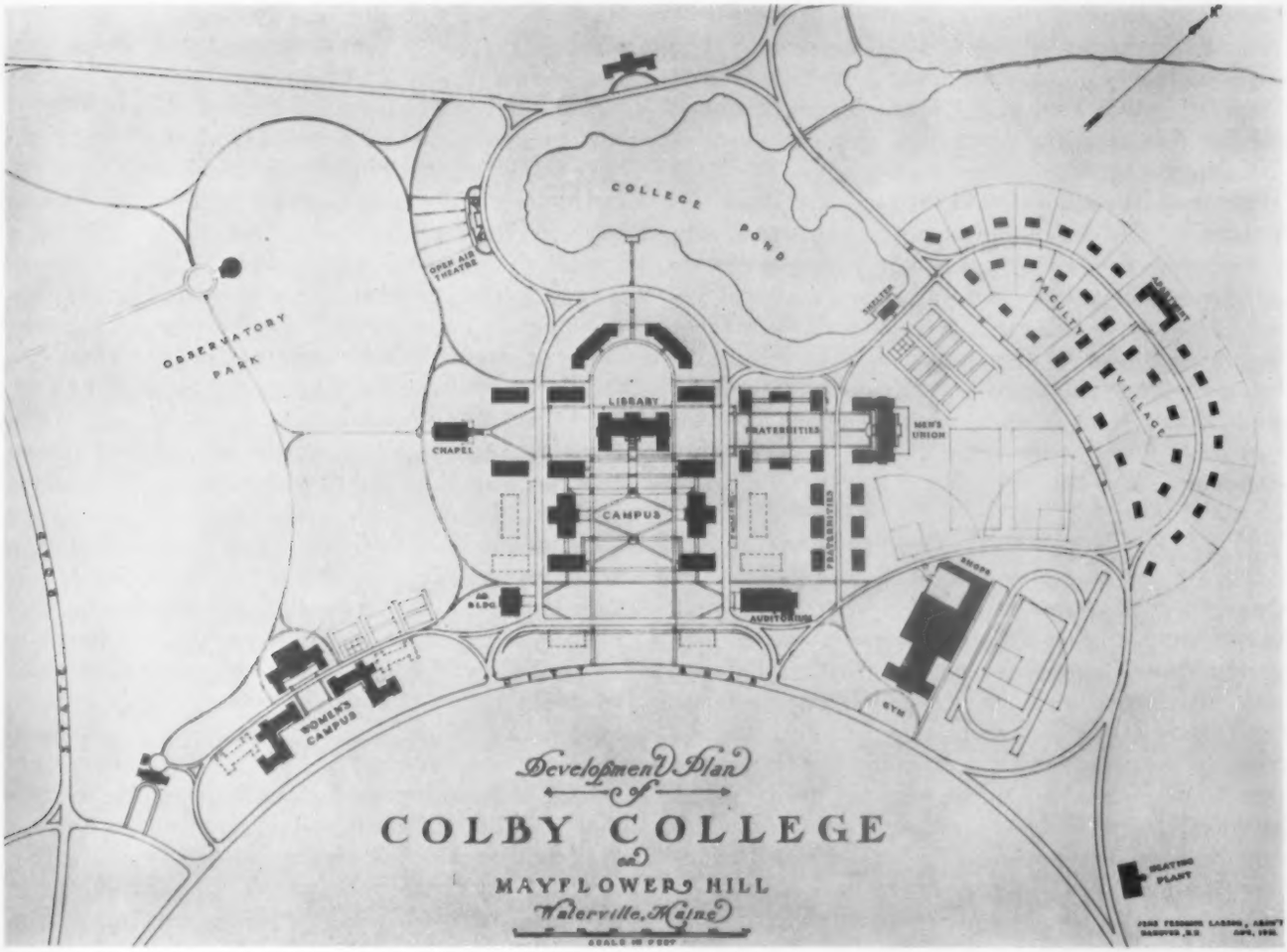
Problems That Were Solved

Space does not permit going into the details of many problems which have been interestingly solved by the architect. These involved both practical and intangible considerations. A few might be listed as follows: the arrangement of the main campus on three sides of a quadrangle, with the open end facing the beautiful view over the city to the hills; placing the campus drives in the rear of most of the buildings, so that traffic and parked cars will not obtrude upon the aspect of the façades of the buildings, and also so that a minimum of student inter-building traffic will have to cross the roads; the arrangement of the academic buildings to illustrate the great divisions of learning; the placing of the dormitories so that students would pass by the library on their way to and from classes and so be tempted to go in and browse more often than would otherwise be the case.

Also, the placing of the men's social union, the fraternity houses and the dormitories so that the fraternity men and the non-fraternity students will naturally mingle with each other; the location of the library at the center of the campus, thus continually emphasizing the fact that books, the stored-up experience of mankind, are the prime source of knowledge; the utilization of the natural slopes so that nearly every building has direct entrances from outside on two floors; allowing space for placing a large number of additional buildings where they will be logically located in the campus scheme, but where the absence of such buildings until needed will not be noticeable.

Planning the Buildings Around the Needs

The plans for the individual buildings were the result of conference after conference between faculty members and the architect. First, the particular needs of each department were analyzed and the requirements worked out in terms of classrooms of certain sizes, laboratories with different capacities and facilities, work rooms, departmental libraries, exhibit space, faculty offices, seminar rooms, provision for radio and sound cinema installation, and so on. The architect then planned buildings to meet these requirements. It should be emphasized that the buildings were planned around the needs, rather than first deciding



The proposed new campus for Colby College. The plot plan above shows the complete layout, and the drawing below shows the architectural style proposed for the towered library and the three science buildings in the right foreground

the number, size and shape of the buildings and then trying to fit the needed rooms into these spaces. The academic buildings are not merely regarded as space where education can take place, but as dynamic working factors in the educational process.

Besides the practical aspect of the plans, the esthetic influence on the students is held to be an important function of the design. Students at the new Colby will be in an environment not only of scenic charm, but also of simple and beautiful architecture and appointments, both interior and exterior. Even those who do not take courses in art will be constantly exposed to these influences, so that as someone once said: "They have learned what to prefer, because they have lived in the presence of things that are preferable."

Personalized Education

One of the characteristics of Colby College has always been the close relationship between students and faculty. In fact, it is this personal touch which many a small college has never lost that some of our great universities are striving to obtain by house plans, tutorial systems and other elaborate expedients. In the plans for the new Colby, however, it has been borne in mind that even more opportunities for friendly informal contacts between students and instructors should be promoted by various means wherever possible.

For example, the building plans provide nearly every department with a small lounge adjoining the private offices of the instructors. This lounge will be comfortable and inviting, usually with a fireplace and supplied with tables for periodicals and abstracts related to the work of that department, easy chairs, and kitchenette facilities for informal "feeds." Such places will be ideal for small seminar classes and discussion groups, as well as for individual students who may want the opportunity for casual chats with the instructors. The men's union will contain living quarters for bachelor faculty members and also a special dining room where students and professors may eat together whenever they wish. Similar accommodations are provided for the women professors and students. Plans for resident faculty members in the fraternity houses are being studied with interest. We believe that the advantages of the famous "Mark-Hopkins-student-log" theory of personalized education can be maintained to a great extent in a college of 600 students.

Colby's project to build a new campus has been under way for about seven years. During the depression, no general financial solicitation was made. This period was utilized, however, in working out the plans unhurriedly and in developing the new campus site, on which about $250,000 has already been invested in the shape of drives, approaching roads, sewer and water services and the like. Within the past year and a half, subscriptions and pledges amounting to more than a million dollars have been received towards the three million which is needed before any of the construction work can be begun. The public interest in our unique experiment in building a functionally-planned campus for this old New England college leads us to believe that our venture will become a reality in the not too far distant future.

SCHOOL-BUILDING PROGRAMS FOR RURAL AREAS

By W. F. CREDLE

Director of Schoolhouse Planning,
State of North Carolina

THE statesmen responsible for the establishment of our first public rural schools were undoubtedly concerned that all children should have an educational opportunity, and it is true that the people themselves voted for public schools. Nevertheless, one is impelled to believe that there must have been a general feeling that the early rural schools were not expected to be quite of the same quality as the private academies and the city public schools which were their forerunners.

That there was such a feeling is reflected in the character of the rural schoolhouses erected during the first seventy-five or more years that they were in operation. In several states these were known as "old field" schools, since land found unfit for cultivation was usually selected for the site, and the designation was not without a touch of ignominy. This was particularly true in the South.

The types of early buildings may be divided into three classes:

1. The log cabin type, designed to "accommodate fifty scholars." This was simply an enlargement of the type of cabin homes from which the "scholars" came.

2. The ecclesiastical type, modeled after the community church, with platform and towering belfry.

3. The two-story type, following the design of the private academy building. Many of these structures contained only two rooms, the upper room, where the principal taught, being reached by an ornate stairway. These edifices, while quite grandiose in appearance, were certainly fire hazards.

Considerable improvement in rural school architecture was apparent by the beginning of the twentieth century. However, the design and arrangement followed all too closely the poorly planned city buildings of twenty years before. Without reason, small buildings were two to three stories in height, and many of them had basement rooms, regardless of any planned purpose or use.

State Divisions of Schoolhouse Planning

The story of the development of the rural school plant and the attendant present-day problems is not wholly a narrative of woe nor a recounting of obstacles, but there have been decided handicaps which must be taken into account. Possibly the greatest of these, until recently, was the fact that the construction of the village and rural school, as well as its maintenance and repair, was the jealously guarded prerogative of the powerful and autocratic local school committee. The unsound philosophy that election or appointment to membership on the local school board carried with it some kind of miraculous knowledge of schoolhouse planning lingered long after hygienic plans were available. These local officials knew but few of the fundamental principles of schoolhouse planning. The tragedy of the situation was that they did not know that they did not know. Teaching them, or better still persuading them to abdicate their authority, was and to some extent still is a problem of the trained school administrator. The establishment of divisions of schoolhouse planning in many of the states, with directors trained under such specialists as Dresslar, Strayer, Engelhardt, and others, was the turning point in the emergence of the rural school plant from long years of chaotic planning.

An old school of the ecclesiastical type, and the modern consolidated school which replaces it and similar structures at Winfall, Perquimans County, N. C.

A new consolidated school at Whittier, Swain County, N. C., replaces scattered frame buildings formerly used as schools

The Consolidated School

Another factor in the improvement of rural schools was the consolidation movement, which had its inception some twenty-five years ago. These programs were conceived by trained educational leaders who recognized the value of schoolhouse planning. The passing "of our little schools," as they were so endearingly called by the pompous neighborhood school committees, tended to decentralization of obstinate local control and gave the competent school man an opportunity to plan plants for modern educational programs.

Recognition of the problem and ample knowledge to solve it did not immediately bring modern buildings. The consolidation movement gained its greatest impetus at the close of the World War. The school-housing programs followed in the wake of the conflict. The inevitable happened: Contractors and workmen fresh from the shoddy mushroom building programs of the Government, made necessary by the war, entered the school-building field with low, if not degraded, principles of ethics. The results were:

Stupendous building programs were crowded into a short space. Plans were necessarily hastily approved, and orderly supervision was sacrificed in the zeal to produce in mass. Bond issues that were voted with quite reckless abandon brought a cantonment type of schoolhouse construction, creating an almost immediate maintenance and repair problem.

These periods of experimentation, of trial and error, with their consequent if unintentional waste of funds, have placed the planners of rural schools in a favorable position. The consolidated school has come to stay. It is just as certain that those charged with providing debt-service funds during the recent days of adversity, for buildings so poorly constructed during the prosperous days, are justly concerned that future capital outlay funds will buy honest values. Such a fixed policy seems to be universal.

Differing Problems Involved in Rural and City Planning

When schoolhouse planning is predicated upon the reasonable certainty that the construction will be sound, proper attention can be given to those features of the building that will make for the most efficient teaching. Certainly, the perfecting of the educational program is the function of all school plants and the sole purpose of the schoolhouse planner. In providing these necessary material facilities, there are problems distinctly peculiar to a majority of the rural areas.

The concentration of population, wealth, and oftentimes talent, in the cities makes the planning of the city school plants relatively simple in comparison with rural areas where antithetical conditions are the rule. For example, one teacher per grade is one of the simplest of the requirements for standardization of an elementary school in many sections. This constitutes no problem in the city, but in the country the whole organization scheme may revolve about this one point. Other examples illustrative of differences in city and rural school-plant programs could be readily given.

However, despite the dissimilarity in rural and urban planning, the techniques and even the willingness to plan at all for the country child are a definite result of the city surveys. The schools of the nation are indebted to Doctors Strayer and Engelhardt of Columbia University for many of the tools and techniques, and certainly the professional popularizing, of the intelligent planning of school programs.

Planning a school-building program for a rural area must either include a philosophy of school organization or be predicated upon a scheme of organization already agreed upon. Statutory requirements or legislative sanction should precede the survey.

The County-Wide Plan

In North Carolina, the "county-wide plan of organization" prevails. In 1933 all school districts in the state were abolished, with authority given to state and county—not district—officials to redistrict each county. The county-wide plan law had as its objective good school organization; the redistricting law was for "economical administration."

The county-wide plan was adopted in connection with the creation of a special building-loan fund for schoolhouse construction in 1921. Additional funds were made available in 1923, 1925, and 1927. It was a requirement that applications for loans from all these funds should be made by the county boards of education and the boards of county commissioners jointly. Local school boards had no part in them. Conditions precedent to the approval of loans were:

1. The approval of the county-wide plan of organization submitted with the applications.

2. The building to be constructed should contain a minimum of five rooms, modern in their appointments. This minimum with the other requirements was raised to seven rooms in 1923, and obtained through the life of the 1927 fund.

So attractive were the advantages of financing building programs from these funds that 99 of the 100 counties submitted applications.

The lasting good effects of the special building funds may be briefly summarized:

1. The whole district idea of school organization was broken down and schools were planned on a county-wide basis.

2. Consolidation and transportation, with the consequent result that a sufficient number of children were assembled in reasonably well-planned centers to make possible standard elementary and standard high schools, were stimulated by the building funds.

Other states have arrived at organization plans by state subsidies, equalization funds or similar methods. The Federal Government in connection with PWA grants has attempted to encourage, if not to actually require, that the granting of funds for schoolhouse construction be conditioned upon carefully worked-out plans of organization.

The solid foundation of experience, ample legislation, and the current popular acceptance of the wisdom of careful planning before undertaking new ventures and entering into money-spending programs, have placed upon those charged with rural school programs a responsibility and an opportunity for service almost unparalleled in educational administration.

A rural classroom

Archdale Elementary School, Randolph County, N. C.

The Bases of Organization

Those who would essay the task of definitely recommending organization plans and building programs must deal in definite language and figures. To simply state that plans and programs should be "modern" or "ample" or "good" or "equal," will not suffice. Definite suggestions are offered:

1. The survey staff, or planning board, should be thoroughly familiar with all legislative authority, both expressed and inferred, in the statutes.

2. The area in question should be studied and the following materials gathered or prepared:

a. The population changes during the past thirty years.

b. A population and school-building spot map. The people concerned should be given an opportunity to study and verify this before any reorganization is suggested.

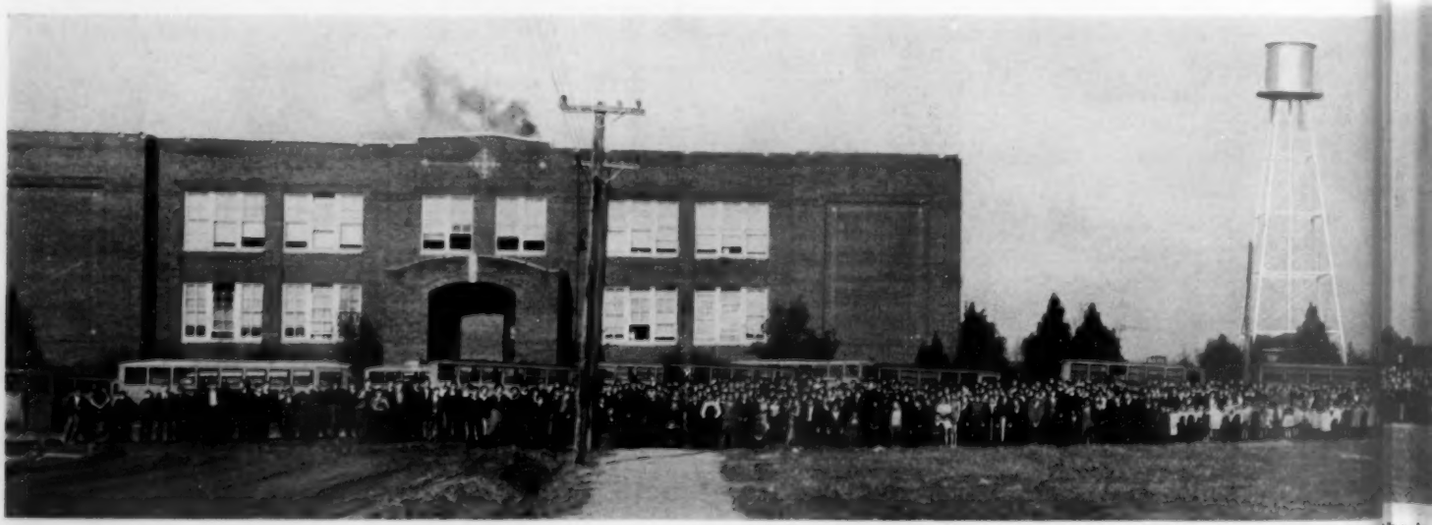
c. Road data, present and proposed. Highway officials should be committed to or against new roads affecting any proposed organization.

3. Standards for accrediting both elementary and high schools prevailing in the state should always be kept in mind.

There should be ability to finance the program on the basis of experience in similar units, with stated valuation and tax rates openly published.

4. The services to be made available on the basis of existing conditions and practices should be determined. Many superintendents have inherited serious problems in administration simply because planners dealt with things hoped for rather than with actual conditions. To promise teachers of special subjects when it has been impossible to obtain them in not unlike existing units, or to suggest that children now within legal walking distance will be transported, in order to gain acquiescence in suggested plans, are dishonest practices and bring both educational surveyors and school superintendents into disrepute.

5. The money necessary to finance the proposed building program should be scientifically and accurately determined. Rural school plants have suffered tremendously because the planner guessed, and guessed too little. Equipment, teaching aids and even plumbing systems have been sacrificed because random guessing was wrong. Here, again, funds to supply these deficiencies can be provided more easily in the city than in the country. Rural voters will oftentimes cheerfully endorse a bond issue for thousands of dollars, but will obstinately refuse to provide an additional penny if the first amount is found insufficient.



Four Oaks School, Johnston County, N. C.

Needs of the Rural School Plant

Once the plan of organization has been agreed upon, the problem of the plans for the schoolhouse and for the plant are special ones in the rural area. The country children who attend the consolidated school know only the school playground. The school auditorium is their only theater. The classroom is the only place where country children match wits in learning and doing, and, hence, developing. To meet the demands made upon it, the rural school plant should have:

1. A minimum of ten acres in the site.

2. Specially designed primary classrooms, a minimum of 22 x 40 feet, supplied with at least 20 feet of bulletin board and a like amount of blackboard. These rooms should be provided with bookcases, magazine racks, project lockers, storage chests, the tops of which can be covered with pallets for rest periods, individual toilets and lavatories, and drinking fountains. The architect who designs, or the school-building director who approves, the conventional 22 x 30-foot room for the under-advantaged country child does him an injustice.

3. Auditoriums with level floors and adjacent kitchens for school lunches and community use are desirable and practical for rural schools. These should be so located as to make it possible to lock them off from other parts of the building, with a view to making them available for children who arrive early in the morning on the buses or must remain late to get the buses in the afternoon.

Other features of the rural school plant should be planned with the same care. It is as impossible as it is unnecessary to outline all of them in this article.

A classroom corner showing facilities typical in modern rural schools

Summary of Guiding Principles

In summary, the educational administrator should realize that an adequate building program for the rural child presents a particular problem, if the peculiar needs of country people are to be met. The bases on which these programs should be projected are:

1. A thorough knowledge of rural conditions, physical and human.

2. An unfaltering willingness to face conditions and deal fairly with them.

3. A realization that it is peculiarly at school that the country child must look for training in practically all aspects of his social life and his preparation for citizenship. The breaking-down of traditions and the clearing-away of tenacious obstacles by recognition of large units as the most efficient have made an interesting and noble task possible of achievement.

y, N. The largest consolidated school in the world

HOUSING THE INDEPENDENT SCHOOL

By EUGENE RANDOLPH SMITH

Headmaster, Beaver Country Day School, Chestnut Hill, Mass.

CONTRARY to what many suppose, building for independent (private) schools differs quite markedly from that for urban public schools, even though criteria for various details remain the same. There is somewhat more similarity between independent schools and what would be desirable for the public schools in the country.

The differences arise somewhat from the following facts. Many independent schools are boarding schools or country day schools, differing in program and needs from most public schools.* The independent school is dealing, in general, with a rather definitely limited number of pupils, and that number is small as compared with the number in most urban public schools. To justify its existence to patrons, it must provide superior accommodations. The superiority may consist in such elements as:

(1) Intimacy and beauty combined with convenience, as contrasted with what might be considered as efficiency for group handling.

(2) Spaciousness beyond minimum requirements.

(3) Provision for dealing with the pupils in small groups. This includes in many cases provision for class groups that may be set at anywhere from 10 to 20, rarely more, and also for breaking these class groups into still smaller units for various purposes.

(4) Maximum provision for work in special fields, such as the arts. An independent school may provide as much space for fine arts and crafts, music and drama as would a public school with many times its enrolment.

(5) Greater space in proportion for offices. The independent school is expected to give more service of an administrative sort than is possible in most public schools.

(6) Extensive use of out-of-door areas.

(7) Some saving in corridor space because of the smaller groups and less difficult traffic situation.

The independent school does not have the problem of fitting into a plan involving many schools in the same way that a city public school does. It does have an equally important problem concerned with anticipating the demand for its services within a certain area. It must consider its location very carefully in regard to desirability from the viewpoint of patrons, accessibility, and available land suited to school purposes.

The Location of the School

Most of what have been called "private" schools have now become public institutions, incorporated as educational organizations not conducted for profit. They have boards of trustees which are responsible to their communities or constituencies for the conduct of the institutions. The boards that are conscientious and well-informed regard a building program as a most serious matter that calls for careful research. In considering the erection of a building for a day school they will study all locations about a city that offer adequate space and acceptable conditions. There will be taken into account the distribution of public and independent schools in the city, the service rendered by them, and the desirability of supplementing that service. The accessibility of various locations to families likely to become patrons will be given great weight. This accessibility will be considered in regard to those within walking distance, those using family automobiles, those coming by public conveyances, and those who must come by omnibuses serving the school. This factor is of the utmost importance. Schools have been forced to close because shifting populations took away their possible patrons (particularly true for young children), or because their locations made it too difficult for pupils to reach them.

It is evident, of course, that it is often difficult to combine ample and suitable land with an accessible location. However, since the whole trend of independent day schools is toward country surroundings near their cities, where the pupils are able to use the out-of-doors freely, having space for playgrounds, gardens, and woodland, this is a problem any school must consider and if possible solve.

A mistake sometimes made by schools is to buy a tract of land without considering fully the placement of the main building on it. Those who have not studied school building are likely to ignore the great importance of the orientation of the various rooms, which often determines the placement and arrangement of the building itself. Ignoring this may later make it necessary to place classrooms facing the busy road that makes the site accessible, or overlooking a playground in use by other pupils during class time. Only after such factors as these have been considered should land be bought.

* In this discussion I shall limit myself to the day school, and shall have in mind the tendency in such schools, which is toward a "country day school" type. I do this because residence building for boarding schools is a separate problem, and educational buildings for boarding schools differ little in their requirements from those for country day schools unless classes are scattered among various buildings, when the problem is again a different one.

The hilltop is occupied by playground apparatus on which about 150 pupils can play at once. The banks of six windows in the building are in home rooms that are 20 feet wide and 30 feet long. They accommodate 20 pupils each. The banks of four windows in the picture below are in supplementary classrooms of the sort discussed in the text

The Needs of the School

Let us suppose, then, that the right location has been found and obtained. Preferably before this, the needs of the school should be carefully analyzed. How large a school is desirable to accord with the school's educational policy? What sex or sexes? What ages? What particular emphases or local demands or conditions will affect the building plans? What will be the maximum class size? Will the school use "home rooms"? Will pupils study in their own rooms, in a study hall, or in libraries? How broad a curriculum will be offered? What kind of use will be made of the building because of the school's educational policy and teaching methods?

The answers to these and other questions should result in a table supplemented by adequate notes. The table will list the groups of pupils of various ages, with the provision necessary for each group. It will analyze the use of all supplementary rooms, showing which will be used by a limited number of groups only, which must be available for more groups or even for the entire school. It will suggest grouping of

This picture, taken from the west side of the school, shows the arrangement of parallel wings of classrooms, and the library (second floor) and dining room wing projecting to the west. Under the dining room is the work room for noisy activities, such as carpentry, scenery construction, and work in hammered metals

This classroom for older pupils is 20 feet wide and 25 feet long. It has a maximum of light from the east, and a simple system of window ventilation in addition to the mechanical system

rooms, state required, or desirable, orientations for the rooms; in fact, it will give such a basis that the architect can plan the interior of the building first, leaving the exterior to be designed after the essentials for school work have been satisfied.

Orientation and Planning of Rooms

I have spoken of orientation of rooms as an important part of the planning. Various theories have been advanced for this, usually with little but unproved opinion to support them. At the time The Beaver Country Day School was being planned, a most complete investigation was made of orientation for classrooms in which pupils were to do much of their desk work. A model classroom was lighted by a searchlight sun, duplicating elevation and direction throughout the year, and the results were graphed for various orientations. The conclusion was that east exposure was found to be the most desirable for the latitude of Boston, with west also good, though with some disadvantage. It seemed also to be shown that some rotation toward the north of east would care for most of the more southerly parts of the United States, while a slight rotation to south of east might be desirable for more northerly locations.

Many, if not most, independent day schools base their organizations on "home rooms" which serve as centers for the various class groups and therefore for individual pupils. In some cases pupils occupy their own desks and chairs, fitted to them, for most, or all, of their academic work, including classes and such study as does not require use of the library. In other cases, these rooms are centers for various departments, and pupils move from room to room as necessary. This has some advantage in the use of specialized material, but has the disadvantage of requiring pupils to use furniture not fitted to them. Still another method regards these rooms as freely used workrooms rather than classrooms.

The more the pupils use these home rooms, particularly for reading and writing, the more important their planning becomes. In general, these rooms should have east exposures, they should face south, and the east side should be uninterrupted window space from the back wall to within about six feet of the front, and from the ceiling to windowsills at about desk height. I say "uninterrupted" because the practice of alternating windows and wall sections does not give satisfactory lighting. The bands of light and shadow are bad in themselves, and it is not possible by such an arrangement to give a room adequate light. The rough rule for window space has been that lighting area should be over one-sixth, and had better approximate one-quarter, of floor space. Recent studies of lighting, however, seem to show that the maximum light that can be brought into a room is none too much, if it is enough, for the use of children's eyes.

Orientation changes for the youngest pupils, for with little or no use of books, light from more than one

side and sunshine throughout the day become desirable rather than a disadvantage.

Area and Height of Rooms

The floor area actually needed in a room depends on the age of the pupils and the way in which the room is to be used. For secondary school pupils in a room with movable furniture that is used for classes and study only, 25 square feet per pupil is probably the minimum that will allow some space for supplementary material, and some freedom and flexibility in the room's use. The requirement increases as the pupils are younger. Junior high school pupils need perhaps 20 per cent more space, as do the upper grades of the elementary school; and nursery school, kindergarten, and first primary groups can well use 60 or more square feet per pupil. Rooms such as studios, laboratories, and others need special determination.

The area of a classroom should be so arranged that all pupils are near enough to the windows to have good light. A working rule that the room should not be over twice as wide as the height of the windows can be met by making the width not over 20 feet, perhaps less for rooms with under 18 pupils, 12 years of age or older. For example, 20 pupils of age 12 would have good conditions in a room 20 feet wide and 30 feet long, while 15 pupils of this age would be well cared for in one 18 feet wide by 25 feet long.

Rooms need not be so high as is sometimes thought necessary. Such rooms as I have described will have ample air space with a height of 11 to 11½ feet. They will be cheaper to build and easier to heat than higher rooms and will be pleasanter in other ways. The only advantage in the high rooms is that of a greater window area.

Flexibility in Use of Rooms

Because of the flexibility with which the better independent schools carry on undertakings in small groups, and allow wide ranges of elections, they need a liberal provision of smaller rooms well located for convenience and good conditions. I believe that a school needs at least half as many of these smaller rooms as it requires home rooms to accommodate its student body. The best location for them is across the corridors from the home rooms; that is, with west exposure and facing north. Their size depends on the uses to which they are to be put, and the money available. For a school with class units of 18 to 20 in the home rooms, an area of approximately 300 square feet is satisfactory for a supplementary room.

It is important to have the age departments of a school so separated that their differing programs will not interfere with each other. Very young children should not have their activities watched, nor their rest periods disturbed by older pupils. Similarly, recess, lunch, or recreation periods at different times can be a source of acute annoyance to the departments concerned. If it were not necessary to use some rooms and some equipment in more than one department, this separation would be much more simple. As it is, the best solution lies in placing such common rooms in

This library is a pleasant workroom. Schools are making more and more ample provision for library space, and the tendency is to plan for special libraries for the different age groups

places accessible to the various departments without the necessity of passing through each other's corridors, and this may prove no easy matter.

The most desirable shapes to meet these and other needs, but particularly those of good lighting, consist of three or more building sections of moderate width placed together so as not to interfere with each other, yet to allow easy access to all parts. The result may enclose a court with or without extensions of its sides, may make a letter T or H or the Greek π, may be a long north-and-south line of classrooms, one or two stories high, divided into departments by the breaking of its length line, and modified by rooms or wings fitting on its west side, or one of many such variations.

Practical Suggestions

Among interesting features being used in various independent schools are the following:

Improved open-air gymnasiums, and consequent lessened emphasis on the traditional type of indoor gymnasium. The open-air gymnasiums are surfaced for all-year use, and may be covered or not.

Interesting groupings of studios devoted to various arts and crafts. The noisier handwork, such as carpentry and hammered metals, should be so placed as not to disturb classrooms, library or other rooms needing quiet.

Music departments, including larger rooms for chorus work and informal concerts, smaller rooms for listening to records or radio concerts, and for instrumental lessons and practice. Such rooms should be well soundproofed, but should also be so placed that sounds coming from them, particularly in weather when windows are open, are not disturbing.

Multiplication of display space with cork boards of large area in the rooms and corridors, cabinets with glass fronts in many locations, perhaps a special display room.

Ample provision for the physical education staff and activities, including indoor playrooms for stormy weather.

For girls, a supply of practical practice kitchens, sometimes associated with the lunchroom department.

Increasingly ample library provision, preferably with special libraries for different ages.

Rest rooms, with provision for rest for all younger pupils.

Provision for dramatics, with well-equipped theater, workrooms of various kinds, costume closets and storage space for scenery. The theater may be a combination assembly hall and theater, perhaps large enough to seat double the entire student body, and completely equipped for dramatic use.

Greater attention to the use of color and decoration.

More than adequate entrances and exits, perhaps with many home rooms having their own outside doors.

Coat closets that are more convenient, less likely to be trouble-breeders, and less detrimental to the looks of the school than is usual.

The kind of coat closet that has proved most satisfactory in the independent schools is built into the wall in the corridors outside the classrooms, each section against the classroom taking care of the outer garments of the pupils in that room.

Various ways of opening and closing these closets have been tried. The most satisfactory seems to be the one that uses doors that turn back into the wall in the same way that the door of a telephone booth opens. This leaves the entire coat closet space open to the corridor while pupils are getting their coats, yet closes the closets again so that their surfaces become part of the corridor wall when the closets are not in use. The outside is often paneled and made a decorative rather than an unpleasant feature.

Inside the closets there are coat rods with a hanger for each pupil, places for hanging hats, and usually compartments in addition, one for each pupil in the room. Rubbers or overshoes can be kept on the floor.

Among advantages of this type of closet is the immediate accessibility of the closets, either to a single pupil, or to all the pupils in the school at once; the fact that there is no space to hang around in an unsupervised part of the building, as is often true in regard to coat closets; the fact that they can be attached to the ventilating system and therefore can be kept fresh and clean, without odor from wet garments; and the fact that they often can be built for very little cost because they occupy space in the wall that may be necessitated by ventilating flues through certain parts of it but the main part of which would be wasted if it were not used for such a purpose as this.

Possibilities for the Future

There has even been suggested the possibility that some of the schools may develop as workshops for all kinds of school purposes, with few if any traditional classrooms, though no academic school has as yet completely carried this out.

While these condensed suggestions may give some idea of the possibilities in school construction, it should not be assumed that school building is a matter of mechanically applied rules. There is need for imagination and creativeness in each school planned, and an open-minded original architect working with experienced educators can make any school building a beautiful and efficient place in which to live and work.

SECTION II
DESIGN AND CONSTRUCTION OF BUILDINGS

MODERN MATERIALS AND METHODS OF CONSTRUCTION FOR SCHOOL BUILDING

By A. C. SHIRE

Technical Editor, The Architectural Forum; and Consulting Engineer

A REALIZATION that changes in educational methods are hindered by the monumental type of school building is resulting in a trend toward a different kind of structure. The keynote of the old type was permanence, reflected in large, heavy buildings, expensive to build and expensive to alter. They were built to inculcate the idea that the old ways are the best ways.

Today, realizing that we are facing a changing world, we are trying to change our methods of teaching. In this period of transition, a major requirement for school building is flexibility. We need buildings that can be altered and, going a step further, that won't last so long that coming generations will be saddled with buildings they don't want. Unfortunately, there is no one formula by which flexibility can be attained. The sparsely populated rural district can build temporary one-story wooden structures, but the city has problems of fire protection, high land cost, and a large school population.

One fact stands out: in the construction of all kinds of buildings, height costs money; it means heavier, more durable construction. High buildings must be more fire-resistive, require more space and involve more expense for stairs and stair halls, elevators, and corridors, and are not well adapted to the greater outdoor activity which is an aim today. One- and two-story buildings are less costly to build, are more easily altered. Hence, so far as available land permits, it is desirable to keep school buildings low.

In the last two decades a great deal of experimental work has been going on in developing new materials and methods of construction for houses. Much of this is applicable to the construction of one- and two-story school buildings, lends itself readily to alterations, and even permits of ready demolition and rebuilding.

Two principles are followed in modern building technique: the shop fabrication of larger, more accurately sized building units to reduce waste and field labor; the more rigid application of engineering knowledge to reduce weight without loss of strength. These principles have found their greatest application in three materials—steel, plywood and precast concrete.

Steel

The use of light steel framing has been a forward step in the reduction of weight. Stiffness as well as load bearing is required of a frame. Light members placed close together not only accomplish this but make possible the use of thin materials applied to the frame for finished surfaces or for the application of the finished surfaces. Not only are lighter structural steel shapes being rolled, but steel members made of bent strip steel sheets or narrow strip steel pieces built up and welded into truss or trellis-like members are becoming more common.

As a step toward the larger unit idea, some manufacturers are welding their members into rectangular frames, and some are going still further in this direction by fastening to the frames in the shop sheets of structural wall board or plywood. These panels, fastened together on the job by various patented or proprietary methods, form the wall, floor and roof structure of the building. Another method has been to form panels of bent sheets, or sheets and stiffeners welded together. In this way frame and surface become one, and advantage is taken of the load-bearing strength of the surface.

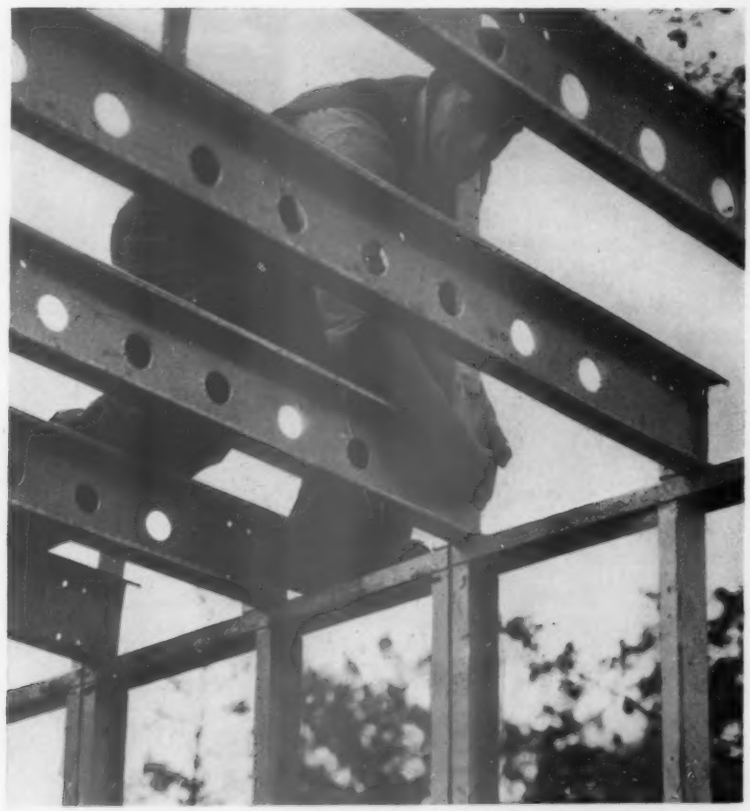
Plywood

This utilization of the strength of the surface by making the surface one with the framing or stiffeners behind it is known as the "stressed covering" principle and is quite common in aeroplane construction. Adequate strength is thus attained with a minimum of weight.

The sidewalls are set between the light steel studs of the wall framing. These large panels are made with an insulating core covered by fire- and weather-resistive asbestos cement whose smooth surfaces require no further finish

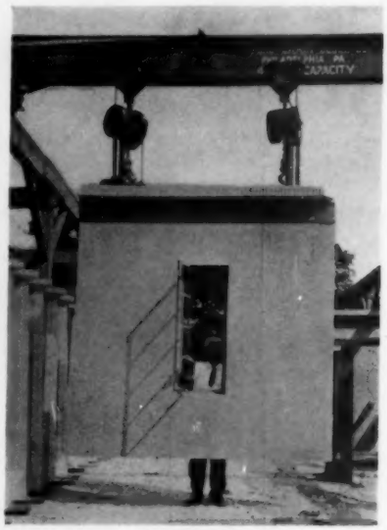
Light truss-like steel joists support floors and roof. The flooring consists of structural gypsum planks which will be surfaced with hard compressed wood. Spun glass wool insulation is shown above roof steel. A non-combustible prefabricated structure

Right—
Putting strip steel floor joists on the wall framing shown below. The holes lighten the joists and permit the passage of pipe and wire



Below—
A strip steel frame made of shop-assembled panels. Adapted for use with almost any kind of walls and floors

Plywood lends itself readily to the application of this principle. When two sheets of plywood are glued to opposite sides of wood stiffeners, the resulting panel is much stronger than if the plywood or other wood sheathing were nailed to the same wood stiffeners. Large panels can be made in this way which are light enough to be readily handled but are strong enough to form the walls, floors, and roof of a building. Neither a separate frame nor additional surface materials are necessary with this construction. Buildings have been constructed in which the outside plywood sheets of the wall panels are the outside wall surface, protected only by paint; and the inside sheets are the inside wall surface, stained, painted or papered. Similarly, the upper sheets of the floor panels are the finished flooring, and the under sheets the ceiling. Wall and roof panels have insulation built into them in the shop. The result is a structure which can be easily and rapidly erected, easily added to, or readily disassembled and the panels moved and re-erected on another site or in another form.



A thin precast concrete wall slab with cast-in window and colored surface and decoration

Plywood construction of this sort is almost always glued up with synthetic resin glue—a material almost exactly like bakelite. This glue imparts to the panels most of its own properties. It forms a bond between the layers of wood that is stronger than the wood itself, a bond that is unaffected by moisture or lack of moisture, or by natural temperatures; it makes the wood resistive to termites and rodents, and even very much more resistive to fire. If the panels are filled with a non-combustible insulating material such as mineral wool, they will not support combustion and will be quite resistive to the passage of fire. The fire- and weather-resistive qualities of the plywood can be still further increased by covering the outside with a sheet of asbestos cement or a thin sheet of steel, or the steel sheet can be glued between two layers of the wood.

While plywood used in this way is still a comparatively new material of construction, it is finding increasing and varied uses. The hotels and other buildings of the trans-Pacific airline on Wake, Guam, and Midway Islands, houses, trailers and truck bodies, are made of plywood panels. The Forest Products Laboratory of the Department of Agriculture has a large storage building made almost entirely of plywood. The roof is covered with roll roofing; the walls inside and out, merely painted. The columns and trusses which support the roof are made of laminated wood. The trusses have a clear span of about 50 feet, are attractive in appearance, and are excellent for auditoriums and gymnasiums.

Concrete

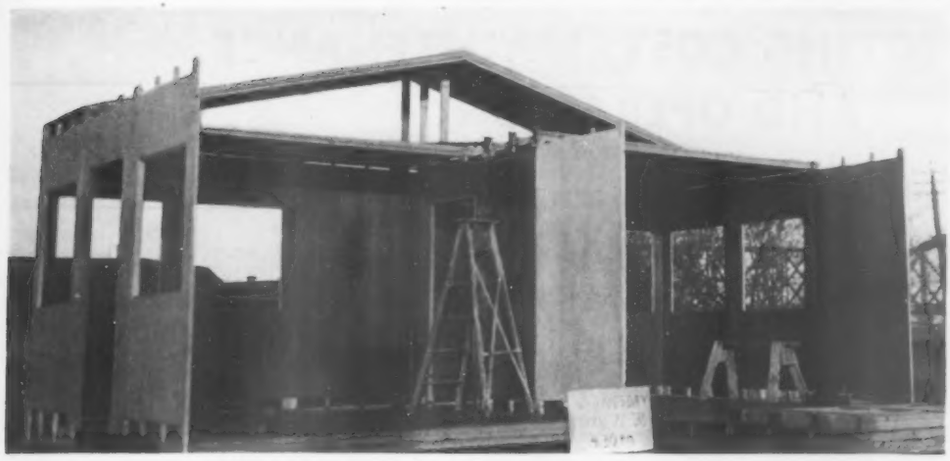
A great deal of work has been done in recent years in making concrete with light-weight aggregates and in precasting joists, thin slabs, and hollow units. With the control of conditions possible in the shop, and with the knowledge of concrete we now have, much is possible. There are too many systems of precast concrete to cover them in the scope of this article. The local availability of a particular method or system will in all likelihood govern its choice, since such concrete units are too heavy to be economically transported over long distances.

Factory-Type Construction

Another, rather different, form of construction which has advantages for school building is the steel-and-glass construction widely used for factory buildings. The school and factory have similar building problems: to provide working space with ample light and air for a number of people; to be able to use that space in different ways as changing conditions dictate; to spend no more on building than is necessary to provide efficient shelter for people and equipment.

Not all the methods of construction described here are at present available everywhere in the United States, though their manufacture and local availability are rapidly spreading. Their cost, too, is not as low as it will be when they become more widely used. More widespread use is being retarded in many places by rigid building codes which prohibit their use, particularly for school buildings. Building codes must be changed so that materials and methods of construction which meet reasonable performance requirements will be acceptable, instead of only certain specified materials, and performance requirements must be more realistically related to the hazards involved.

Here and there, school boards and school architects are taking advantage of modern building techniques. Unfortunately, too many of them are still building enduring monuments to local pride which will be a source of concern to future generations.



The entire structure is made of plywood panels. Panels are shipped complete with insulation and interior finishes, even flooring. The outside requires roofing and painting on the job. No separate framing is needed with this structure

Benchill School, Wythenshawe, Manchester, England. This building is so constructed that parts of it may be readily taken down and erected elsewhere, or it may be easily added to if greater capacity is needed

Open-air school at Suresne, France. Small one-room buildings are the unit of construction, providing a maximum of flexibility at a low cost. Glazed folding walls bring the outdoors in

PLANNING, CONSTRUCTION TYPES, AND MATERIALS, AS AFFECTING COST, MAINTENANCE, AND OPERATION

By FRANCIS R. SCHERER

Architect; Superintendent of School Buildings, Rochester, N. Y.

EDUCATORS and school administrators might well criticize many of the buildings that have been built for them. Splintery floors, leaky roofs and walls, rattling windows, faulty acoustics, poor plumbing fixtures, and inadequate heating systems, one or more, make for a less efficient and less satisfactory school. There are many cases, though, where the materials are not so much at fault as were the planning and arrangement. We are apt to find that either the designer has failed to plan the building properly to house the educational program, or the educational program was not adequately set up for the designer.

National groups and state departments of education, however, have done much during the past decade to stimulate better schoolhouse construction throughout the country. With the need for a new building definitely established by means of a proper survey, and with a preliminary plan mutually agreed upon by the school board, the superintendent, and the architect, the choice of materials for the construction and equipment comes up for consideration.

Whatever our particular role may be in connection with bringing into being a school building, we strive to avoid excessive costs. The quest for economy, though, should not be limited to initial costs, but should be carried on with particular emphasis on those ever-recurrent costs of operation and upkeep.

Choice of Materials

A material, to qualify as satisfactory for use in a school building, must meet, first, the demands of the designer as to architectural and engineering requirements, and also be satisfactory as to both cost and quality. The school administration should be satisfied that materials are correct for the intended use, particularly for the instructional and instructional service occupancies. Furthermore, a material should meet the requirement that it will not unjustifiably increase housekeeping costs.

The type of architecture and the quality of construction largely dictate the materials entering into the construction. It is perhaps of greatest importance that the awarding authorities engage a competent architect, one in whom they have full confidence, since most decisions regarding materials should be made or influenced by him. There are always instances where the teaching, operating and maintenance staffs can make worth-while contributions concerning materials and equipment, from experience gained throughout their years in school plants.

Climatic conditions, availability of materials, and the attitude of local bidders, are factors influencing choice. It is the exception today when a new school building of two stories is not designed to be at least of semi-fireproof construction.

The Basic Design

Structural design must be accurately made and carried out so as to carry safely the floor and roof loads, and withstand wind pressure and earth disturbances. For the structural parts of buildings one finds but little difference prevailing throughout the country in so far as basic design and choice of materials are concerned. The design practically limits choice of materials to steel, cement, brick, stone, sand, and gravel. The minimum qualifications each of these must possess are listed in the Standards of the American Society for Testing Materials.

Since the structural features are for the most part hidden, they seldom excite the interest of anyone but designers, builders, and small boys who watch erection progress and wish they too could play at catching hot rivets. We take for granted the safety of our schools when we send our children into them, feeling that because they are public buildings they are all right. When we read of a building failure or a fire in some community other than our own, we remain quite calm about it and refuse to believe that it could happen to us. Most school-building disasters are attributable to faulty planning, principally in exits, but in many instances unwise choice of materials has added to the hazards. A frame partition in a basement is cheaper and easier to build than one of noncombustible material, and it is usually difficult for us to see how any particular harm can come to it. But, somehow, harm does come, causing property loss and occasionally exacting human toll.

Next we consider the parts of the building we can see, and quickly, and perhaps wrongly, evaluate, from that first impression, a good, bad, or indifferent job. The proof of the good job, however, actually rests in the design, materials, and workmanship, perhaps

much of it hidden from view, but emphasized year after year as the building spans a long life, affording a wide measure of safety, and requiring a minimum expenditure for operation and upkeep.

The enclosing walls are items of considerable importance. Geographical location influences in large measure the character and quality of the exterior walls. Generally, these are of masonry units such as brick or stone, laid in lime and cement mortar. Precautions should be taken to avoid or minimize rain leakage. A few years ago, while visiting on the campus of one of our largest universities, I saw several men at work on the exterior walls of a memorial building, and found that the walls leaked so badly through the mortar joints that the floors had to be mopped after every rainstorm. Thousands of dollars had been spent in correctives, but no lasting remedy had been found. The drastic repairs under way would correct the conditions, but at tremendous expense.

The character of the brick or stone to be used for facing should be determined by test, and the mix of the mortar designed in the light of this. Nothing in connection with a school building depresses certain taxpayers more than to see one of their recent, expensive investments sporting patterns of ugly efflorescence on its pretentious façade. Care in selection of materials, and proper workmanship, are the necessary preventives.

While the double-hung wood window still retains much of its popularity, several other types are on the market, each meeting with more or less favor in different sections of the country. The matter of climate is a big factor in making the right selection. I am sure that most of us have been in schools at some time or other where the wrong type of window had been used, since opening them was an almost impossible job. In our northern areas, with driving snowstorms and sub-zero temperature, it is desirable that windows be weatherstripped, and their setting in the masonry walls permit adequate calking.

Manufacturing processes for flat glass have improved so that today in even the larger school windows we can get at reasonable cost panes of glass that no longer give serious distortion.

Interior walls are usually laid up with masonry units such as brick, tile, gypsum, or cement block. For most occupancies these are plastered with a lime or gypsum plaster and subsequently painted. And speaking of paint—it should be easy to adjust ourselves to using only highest grade paint materials, since about 80 per cent of painting costs is for labor.

Some occupancies have wainscots of other materials, either for appearance or for utility. There is a trend toward providing wainscots at shoulder height in the corridors, stair halls, and toilet rooms, making them of impervious material such as salt-glazed brick or tile, or terra cotta block. These are more difficult to mark upon, require no painting, and are easily cleaned, and although their initial cost is somewhat higher than that of plastered walls, the ultimate cost is less.

A more recent problem has to do with sound correction. Classrooms having the advantage of fireproof or semi-fireproof construction inherit the disadvantage of excessive reverberation. For general classroom work a satisfactory correction results from finishing the ceiling with sound-absorbent material, such as acoustical plaster, tiles, or one of the several other special materials on the market.

Floors—Trim

There is no one answer to the question as to the most satisfactory flooring for classrooms and other occupancies. Largely, the field is divided between those preferring strip maple and those preferring battleship linoleum, each material possessing certain advantages and each certain disadvantages. To a lesser extent several other types of flooring are used. Wood-block tiles, applied on a mastic bed, meet with favor in some areas; asphalt tile and rubber tile are favored in other places, while in still others, mastic, cork tile, and concrete are preferred. Where linoleum, asphalt, or rubber tiles are used, fixed seats should not be used, since relocating these a few times injures the flooring. To get the best from floors through the years of service, it is advisable to heed the suggestions of the flooring materials manufacturers concerning upkeep. Cleanliness should result without too much expenditure of labor or cleaning supplies, and without causing appreciable destruction of flooring by screw holes made when relocating seats after cleaning.

In toilet rooms, floors of impervious materials, such as tile, are desirable. These should pitch to a floor drain, so as to be frequently hosed and scalded as needed. Corridor floors should be quiet and should lend themselves to easy cleaning. The floor in the gymnasium should be resilient, non-slippery, and yet satisfactory for dancing. Treads of stairs should afford sure footing and should be so constructed that under both artificial and natural light the nosings will be discernible.

Nearly all schools have interior trim of wood. The use of hardwood for trim makes a pleasing interior treatment. As our lumber supply diminishes and prices increase, however, there should be an increase in the use of metal trim and doors, thus further reducing the amount of combustible material in the building. Trim should be designed so as to minimize dust-catching ledges and uneven surfaces in order to reduce cleaning expense.

Roofing

Materials used for roofing are determined largely by the style of roof. Flat roofs are more frequently found in regions where there is considerable snowfall, since one of their advantages is the elimination of snow slides. Such roofs are usually built up with roofing felts mopped in hot asphalt or pitch, and left with a smooth surface or coated with slag or gravel. Pitched roofs usually are covered with slate, asbestos, or asphalt shingles. Occasionally, metal decks are used. Greatest satisfaction and economy will be had by paying the somewhat higher initial cost and having all metal work in connection with the roofs done with non-ferrous metals.

Fully as important as the materials in the roofing is the workmanship. A leaking roof will not only be an annoyance, but may cause considerable damage before it is discovered. I recall an instance in a large school where roof leaks penetrated the roof deck and attacked the metal lath to which the ceiling plaster was engaged. Progressive corrosion advanced to a point where an area of the plaster and lath dropped. One pupil was knocked unconscious and another badly hurt. Although the method of construction itself might well be criticized, the fact that the roofing job was not a good one made for the dangerous combination of circumstances. If one does not have a broad background of roofing experience, it would be well to get definite information on the proposed type of roofing from those who have lived with it for some years, and who can certify to its adequacy.

The Mechanical Services

Proper materials for the mechanical services take on special importance, since, as a rule, the life of these is considerably less than of other parts of the building. Inferior materials result in leaks in supply services and thereby unwarrantably increase the cost of operation. Pipes and fittings that plug up or corrode after they have been in use a few years increase upkeep costs because of repairs and replacements, which, if delayed, make for sloppy operating conditions. How much wiser it is to pay a little more at the outset and, particularly where replacement is difficult, to put in materials about which we know or can find out that they should last for a considerable time. Why distribute hot water through ordinary steel pipes when we are reasonably sure that in less than eight years the flow through those pipes will be materially reduced by rust and scale? And why send steam returns back through ordinary black pipe, placed so as to make replacements difficult and costly, when we know that the condensate will eat out that pipe within a few years? It is true that when the plants are new, one cannot tell the difference as far as operating costs are concerned, but what a huge difference takes place as the plants grow older.

There are such items as the drainage lines from laboratories and shops into which acids might be dumped. Unless special acid-resistive materials are used in these places, we must expect their early disintegration. There is no place in school buildings for inferior faucets, valves, and traps. These are used principally on steam and water lines, and if they are subject to frequent or constant leaks, it takes but a short time to waste the difference in cost between the cheap and good materials. And the unfortunate thing is that the waste goes on and on, since it is much more difficult to overcome leaks in the cheaper equipment.

Usually no part of the building comes in for better control than the electric work, by reason of the requirements and inspections by the fire underwriters. Unfortunately, however, the rating boards are too infrequently consulted concerning other phases of the building prior to its actual construction. Such oversight results in higher insurance rates because of certain omissions or commissions which could easily have been avoided by an early review of the plans and specifications. Measured over the life of the building, the higher insurance premium that must be paid is away out of proportion to what the first cost of the corrections would have been.

In our colder climates the cost of fuel is the largest single item, other than personal services, in the operation of the school plant. We have the problem, therefore, of designing the heating and ventilating plant not only to operate most efficiently and economically, but also to provide against excessive loss of heat through the walls and ceilings. I have already touched upon the matter of weatherstripping and calking of window frames so as to reduce infiltration. We must see, however, to the construction of the walls so as to prevent rapid heat transfer and to reduce the chilling effect on the interior surface in order to avoid condensation when humidity is maintained at the comfort point.

A double advantage accrues from having the roof construction adequately blanketed so as to reduce heat loss; not only is there a saving in direct radiation, but the building will be more comfortable in the warmer seasons when the sun shines hot upon the roof.

Mechanical equipment, consisting of boilers, pumps, fans, motors, control systems, and the like, must be carefully chosen with full knowledge of performance. My own community receives financial aid from the state, based on the actual attendance at the school each day. This amounts to about 30 cents for each pupil in the elementary schools and 47 cents in the high schools. It just wouldn't do to have failures in the mechanical services, making it impossible to have

the buildings adequately heated and lighted and the plumbing in working order, since one day out of run for just one of the larger schools would mean a monetary loss of over $1,500 in aid.

True Economy

The desire to hold down the initial cost to a predetermined limit should not defeat the opportunity to achieve long-range economy through savings in maintenance and operation. A much more fertile field for accomplishing substantial initial economies lies in intelligent functional planning on the basis of reasonable rather than ideal use of the facilities to be provided. Unfortunately, there are in the architectural profession today, and undoubtedly will be for many tomorrows to come, practitioners who seek work from school districts on the basis that they can build a better-looking building and a cheaper one than the Jones's district has erected. It should not be expected that trustees and superintendents whose training has not been in building work will delve into the factors that make one building cost considerably more than another though there is no particular difference in looks. No architect or particular school of architects holds the secret of doing cheap buildings. They are the easiest kind to do, requiring no particular effort or background. On the other hand, an architect whose reputation has been founded on good design and construction invariably convinces his clients of the value of using quality materials. A simple but important safeguard thus suggests itself by way of selecting an architect who has been associated in work of the caliber one desires in the new buildings under consideration.

Adoption of New Materials

We could review in more or less detail many diverse additional items entering into the construction and equipment of the school plant. Characteristics of some of these, however, change rapidly. Many manufacturers took the opportunity during the slack period of recent years to develop and improve certain materials. Research work has continued, and design offices have had more time to experiment with newer ideas. Manufacturers, striving to exist or expand in an increasingly competitive market, have exercised ingenuity in producing materials which would be more attractive and sell for less money than heretofore. Not in all cases, however, can we accept the changes as improvements. Many times a careful analysis or test will reveal it to be a cheaper substitute, made to gain favor by its reduced cost but at too great a sacrifice in quality. Increased activities of national groups have helped considerably in spreading new ideas and findings in the general building field. Continuously, committees are at work on various phases of the problems, reporting to the parent groups for subsequent discussion, modification, and adoption by their memberships. These findings are then available to all who wish to use them. In some instances they are automatically adopted as a part of the community's building code. Groups which have made significant contributions include American Standards Association, American Concrete Institute, American Institute of Steel Construction, American Society for Testing Materials, American Society of Heating and Ventilating Engineers, National Council on Schoolhouse Construction, National Lumbermen's Association, and the National Fire Protection Association.

An increasing number of codes of jurisdiction have assisted in stepping-up the quality of construction and character of materials which enter into school buildings. Examples of these are found in the national electric code; the sanitary and building codes of municipalities and states. In communities where such codes are not available, reference can be made to the national codes of the United States Department of Commerce and the Building Code of the National Board of Fire Underwriters.

The foundation for adoption of a new material should be a broader one than that of subjective opinion by persons not particularly qualified in the building field. Sometimes, through lack of understanding or perhaps willfully, a sales representative fails to divulge all the facts concerning a new material he is selling. Where a record of satisfactory experience cannot be secured from a known and reliable source, a wise procedure is to have the materials subjected to acceptance tests. Reputable manufacturers welcome these tests and give full cooperation in carrying them through. The United States Bureau of Standards with its well-equipped laboratories and experienced personnel is constantly engaged in conducting such tests. There seems to be no valid reason, therefore, why any sizable share of the cost of a building should be spent on materials concerning which little or nothing is known.

New materials, constantly being made available, cannot be lightly put aside, since to do so would defeat progress in construction and militate against lower costs. New materials, however, carry with them the problem of determining that they will prove at least as satisfactory as those they are to replace. Today many manufacturers carry on research with regard to their materials either in their own departments, in professional testing laboratories, or at universities. Other organizations and large public school systems conduct experimental work in the various divisions of the school plant. Thus the characteristics and behavior of these materials are made available, so that one ventures into their use with decreased likelihood of error.

Distribution of Research Information

The immediate problem seems to be the need for assembling this information and having it readily available for all those who can benefit by it. It is unfortunate that a better procedure does not now exist for releasing this information to those who would like to have more definite word before proceeding with new school plants or extensive remodeling of old ones. It is hoped that through the American Council on Education a School Plant Research Council will soon be set up, having a permanent personnel which will assemble the results of pertinent research work already carried out, and direct and coordinate additional research work in those fields where it is most urgently needed. With such a research council functioning, it would then seem logical to request the Office of Education at Washington to function as the medium or clearing-house through which all such information could be distributed throughout the country.

A major portion of schoolhouse construction throughout the country occurs in school districts which build but one building during the term of office of an individual trustee or board member. Hence, the opportunity is not always present to benefit from local experience. Such groups would be well repaid, when embarking upon an important building project, for the effort and expense incurred in visiting schools of the type they propose, prior to the selection of the architect. Frank discussion with the board members or trustees, superintendent, teaching, and janitorial staffs of these visited schools would bring to light factors concerning school plants which would not ordinarily be brought out through discussion with the architects for the several projects.

The Architect's Responsibility

Assurance lies in retaining an architect who has quality school work to his credit. The question is asked: How can there be such work to his credit if someone has not previously engaged him? This is cared for by giving consideration to those collaborating (in the capacity of associates or assistants) on satisfactory projects.

The substitution of types of construction and of certain materials can be intelligently made in the light of existing costs if the awarding authority will instruct the architect to provide for alternate bids. Thus frames of structural steel can be made to compete against those of reinforced concrete or wall bearing types. There are several satisfactory floor and roof systems on the market, some of which would show a saving over others in particular localities. Provision for substitutions can be made in the original design and alternate bids taken on the various designs. In this manner such economies as result would revert entirely to the school district. There are many other items which can be given consideration in this manner: for example, the substitution of wainscot material in place of plaster on masonry back-up; the use of various acoustical materials on ceilings; the various types of windows; items of mechanical equipment; and piping. Obviously, this involves more work for the architect and for the awarding authorities, but from it comes the only opportunity to make selection on the basis of definitely known relative costs.

THE USE OF NATIVE MATERIALS IN THE BUILDING OF SCHOOLS AND COLLEGES

By MAURICE JUDD

Information Service, Works Progress Administration, Washington, D. C.

THE use of native materials has been a feature of the school-construction program of the Works Progress Administration, and many a community where native materials were available now has an up-to-date school to replace an outmoded one, to supply deficiencies caused by shifting population, and, in not a few cases, to supply school facilities where before there were none.

Native sandstone, limestone, fieldstone, adobe brick, coquina and even logs have been used in the construction of new schools or additions in the 48 states. The explanation for this is simple. Native materials are convenient in some places and comparatively inexpensive, and they thus permit more of the money allotted to projects to go into labor. In addition, careful planning has made it possible to erect or to repair schools with native materials on a highly artistic as well as a utilitarian basis.

With practically all the stone taken from the surrounding ground for use in its construction, the new field-house of the Fairmont State College at Fairmont, W. Va., is one example of a building that fills a long-felt want. Another school building in the same state, constructed of native sandstone, is the county high-school building at Westover, with accommodations for from 400 to 500 colored students. Previous facilities were inadequate for even half that number. A third school construction project in West Virginia involving use of native stone was that devoted to the building of Roosevelt Junior High School at Parkers-

A coursed stone field-house at Rosier Field, Fairmont State Teachers College, Fairmont, W. Va.

Native stone masonry walls were used for the Negro Central School Building at Westover, W. Va.

Built of native stone, the Roosevelt Junior High School is a new addition to the school plant at Parkersburg, W. Va.

Field-house and gymnasium added to the physical plant of Fairview High School, Fairview, W. Va. The WPA workers responsible for this project used native stone in the construction of the new buildings

The complete rehabilitation of the Sul Ross State Teachers College at Alpine, Texas, included the construction of 14 student houses, similar to that pictured above and the Big Bend Historical Museum at the right

burg, W. Va. At Fairview, a field-house and a gymnasium constructed of native stone have been added to the physical plant of Fairview High School.

Native stone was used in the complete physical rehabilitation of the Sul Ross State Teachers College at Alpine, Texas. Construction included an outdoor theater, a tennis stadium, a bowling alley and a handball court, student cottages, a historical memorial building and a greenhouse. One of the features of this program was the construction of the 14 student houses for use by worthy students of moderate means. Each cottage has two bedrooms and is equipped with modern conveniences. The Big Bend Historical Museum, toward the building of which the Texas Centennial Fund made $25,000 available, is a memorial to the pioneers of the Big Bend, and houses an extensive collection of West Texas scientific material.

An old wooden structure which formerly served as a laboratory for the Agricultural Experiment Station of the Virginia Polytechnic Institute at Blacksburg, Va., was replaced with one of native stone conforming to the architecture of other buildings on the campus. Unskilled laborers, under competent supervision, developed into skilled stone cutters and masons on this job and completed the building in a highly satisfactory manner.

Hand-sawed stone was used in the construction of a new gymnasium and community building for the consolidated high school at Holly, Colo. WPA workmen cut the stone in a quarry ten miles north of the town, and other WPA workers put it in place.

Crowded and unhealthy conditions were relieved by the construction of a new schoolhouse of seven classrooms, library, office and auditorium at Salem, Fla. It is of native stone.

Section of the new Agricultural Engineering Building at the Virginia Polytechnic Institute, erected by WPA in Virginia out of native stone. The stone was cut and laid by relief workers

Above—Adobe brick and stucco were used in building a school at Bernalillo, N. Mex.

Left—Scoriae, or volcanic cinders, as used for a gymnasium at Rozet, Wyo.

Adobe brick, cheaply manufactured, was employed in the construction of a number of school buildings in the Southwest, even in the southwest part of Kansas. Buildings of this type have the advantage of being warm in winter and cool in summer, and are of exceedingly solid construction, as attested by the fact that adobe buildings are standing in New Mexico today that are known to have been built as long as 400 years ago.

Adobe was used in the construction of an unusual type of building for a teachers' dormitory at Antonito, Colo. The WPA workmen manufactured their own brick at a cost of approximately $11 a thousand.

A ten-room school building of adobe brick was constructed at Bernalillo, N. Mex., for both high-school and grade-school purposes. Until this building was erected, there had been no public-school building in the town, and classes had been held in a privately owned building. Another such instance was at Bisbee, Ariz., where a six-classroom building was constructed.

Still another type of native material was used in construction of a new school building at Rozet, Wyo. This was scoriae, or volcanic cinders, a great quantity of which is found in the vicinity.

A new log schoolhouse was built at Dove Creek, Colo. It replaced one which was described as refusing "to contain heat or admit light."

Instances Cited are Typical of WPA Construction Program throughout the Country

These are of course only a few of the instances of the use of native materials in a school-construction program that has seen 1,099 new educational buildings completed by the WPA, with repairs or improvements on 7,176 additional such buildings.

AFTER THE EARTHQUAKE—A LESSON IN SCHOOLHOUSE CONSTRUCTION

By FRANK O. EVANS

Educational Housing Division, Los Angeles, Calif.

AN earthquake shook Southern California on March 10, 1933, and did much damage to buildings. School buildings appeared to be particularly vulnerable because of the large room areas and, in some instances, because of the type of construction. A vast program of rehabilitation and new construction has been carried on since that time, based on the lesson set by the authorities.

School Building Prior to 1933

The older school buildings in Los Angeles, as in other cities, were generally of wooden construction, although occasional brick buildings were erected. In general, these older buildings were well built. The Los Angeles High School building completed in 1890 typifies the older construction. At that time the science of structural engineering was practically undeveloped, yet this building, like many others of the time, was so well constructed that it has stood for nearly fifty years without any evidence of structural weakness. The strength of these older buildings apparently resulted from the fact that they followed the lines developed by centuries of successful building experience. Heavy walls, good masonry work and homogeneous materials all tended to produce the type of building which stood up under any ordinary stress.

Later years brought about a departure from the simplicity and ruggedness of early construction. It was found that better architectural effect could be secured by breaking up the simple lines. In many instances, in the attempt to provide housing for the ever-increasing army of children, haste and sometimes the shortage of funds led to shortcuts and substitutions. In Los Angeles City alone the average daily attendance of the schools increased from 51,713 in 1913 to 243,264 in 1933, an increase of 500 per cent in 20 years, or an average increase of approximately 9,000 children per year. Under such circumstances, there was great pressure for rapid construction, and not enough thought was given to the question of safety, especially since to many of the new arrivals the problems of seismic disturbance seemed remote and unimportant. In many of the most beautiful buildings erected in the period between 1920 and 1926, structural strength was sacrificed to ornamentation and artistic effect. It was in this type of building that the greatest damage occurred in the earthquake of 1933.

After the severe Santa Barbara temblor in 1925, earthquake hazards were at last recognized in the building codes of the state, and in 1927 the Los Angeles City Building Ordinance was revised. At that time special requirements affecting schoolhouse construction were added, including the provisions that all schoolhouses in the city must have fire-resistant corridors, stairs, and exterior walls and that all masonry walls must be provided with continuous reinforced concrete bond beams at each floor and roof level.

Extent of Damage to Buildings in 1933

There were at the time of the earthquake 670 buildings of masonry construction in the Los Angeles District. Of these, after inspection by a crew of competent engineers and architects, structural damage was reported in only 34 buildings, or a very small per cent of the cases. Of these 34, only 16 were reported at that time to be serious, leaving more than half classified as slight or partial damage. It was significant that of these 34 buildings, 15 had been acquired by annexation. Later investigations added a few buildings to the list of damaged structures, but not enough to change the picture materially.

Particularly significant was the showing made by the buildings erected after 1927 according to the provisions of the building ordinances adopted in that year. One hundred forty buildings came in this classification, and in none of them was structural damage found after the earthquake disturbance. In the Watts area immediately adjoining territory in which great damage occurred, fifteen buildings of this type were subjected to a very severe test, but without any sign of weakness. The people of Los Angeles had reason to be thankful, not only because the earthquake revealed the weakness of certain buildings at a time when lives were not endangered, but because the buildings constructed according to the later ordinance stood the test so well.

Not only is the case for all buildings constructed subsequent to 1927 well established, but it was found that many structures built prior to that time were equally good. Many architects had for a number of years anticipated the provisions of the 1927 code and had so constructed their buildings. Practically no damage was found in any building of concrete construction.

Standards of Safety Adopted

During the weeks following the earthquake, the Los Angeles Board of Education and the Superintendent took every possible step to guarantee the safety of children reëntering buildings. Equal attention was given to the matter of providing for safety in case of future seismic disturbances. No building was reoccupied until it had been inspected and passed by a staff of competent engineers. To determine standards for the type of construction to be followed in the future, a committee, headed by Dr. John A. Millikan of the California Institute of Technology, was formed to investigate and recommend in regard to the necessary standards of safety and desirable legislation.

In April, 1933, the State Legislature passed the so-called Field Bill, which placed the responsibility for approval of all school buildings with the State Division of Architecture. This Act also placed in the hands of the State Division of Architecure the power to draw up a code to which all buildings must conform, and made provisions for inspection and the enforcement of provisions of the code. In general, the code later adopted followed the recommendations of the Millikan committee.

Types of New Building

From the discussions that followed the earthquake, it became evident that thought must be given to the type of building used to house school children. Attention was forcibly called to the fact that little damage was done in one-story buildings of wood construction, and for a time there was a strong preponderance of opinion in favor of the one-story building for all schoolhouse construction in this area. A check on actual sites, however, proved that such a program of replacement would be quite impossible without the purchase of large areas of land. Of the 400 school sites owned by the Los Angeles Board of Education, only in a few of the smaller cases was it found possible to draw up plans of one-story buildings without the purchase of additional land.

After considerable investigation it was decided to construct one-story buildings of wood-frame construction for elementary schools, and two-story buildings of reënforced concrete for secondary schools. In a few cases two-story concrete buildings were selected for elementary sites because of lack of ground space, but in general, throughout the first program, elementary buildings were of wood construction with metal lath and stucco exterior.

The hope that the stucco building would be a means of economy and permit a larger number of buildings to be replaced was not fulfilled. Except in a few cases where extensive use of salvage material was possible, the difference in cost between a one-story stucco building and a two-story reënforced concrete building has not been great enough to justify the less permanent construction. From the standpoint of utility, the choice appears to depend on the size of the school. When school facilities must be provided for as many as 800 children, the one-story plant covers too much space and presents serious administrative problems.

Types of Rehabilitation

Rehabilitation of present buildings consisted mainly of installing a structural frame properly designed to take vertical and horizontal loads as required by state law and city ordinances, and utilizing as much of the original building in each case as it proved possible and economical to retain.

Examples of characteristic types of reconstruction projects are as follows:

No. 1—Wood Frame Construction
(Replacement)

A large number of the projects were replacements of buildings so badly damaged or so outmoded that they had to be demolished. Wood-frame construction was used for these replacements owing primarily to low soil-bearing value. This type of building was invariably one story in height, with earthquake-proofing obtained by diagonal bracing of rods or wood.

No. 2—Wood Frame Construction
(Rehabilitation)

Where the soil has a low bearing value, but rehabilitation of the two-story masonry building was more economical than complete demolition, such buildings were rehabilitated into one-story wood-frame construction, so far as the exterior and corridor masonry walls were concerned, the existing foundation and floor construction being utilized. The exterior walls, corridor walls, and partitions in both this and the preceding type were finished with metal lath and plaster, the plaster being cement on the exterior.

No. 3—Rehabilitation by Use of Reinforced Gunite

A large portion of the two-story masonry buildings were rehabilitated in this manner. The procedure in general is as follows: Four inches of the exterior and corridor walls were removed, and chases were cut to varying depths to furnish space for columns, beams, and diagonal bracing. Reinforcing steel was placed in these chases, and the whole surface covered with diagonal reinforcing steel both ways. The walls were then brought out to their original face with gunite. The floors and roof construction in these buildings were strengthened by additional anchorage, and in some cases by a complete steel diaphragm spanning from exterior walls to corridor walls, and from corridor wall to corridor wall.

No. 4—Rehabilitation by Use of Structural Steel

In some cases, the entire masonry wall, exterior and corridor, was removed, and replaced with structural steel columns, girders, and diagonal bracing, finished with metal channels, furring, metal lath and plaster. The floors and roof construction were strengthened as described in No. 3 above.

No. 5—Rehabilitation by Means of Reënforced Concrete

In some cases, the exterior and corridor walls were removed and replaced with reinforced concrete walls. The floors and roof construction were strengthened as described in No. 3 above. Where masonry cross-walls occurred in this type of construction, they were replaced with reinforced concrete.

David Starr Jordan High School
New Administration Building

Built like a fortress. This was one of the first new buildings to be erected when the structural requirements were most stringent

Sumner P. Hunt, Architect

Graham School
Rehabilitated Main Building

An example of exterior walls reinforced with gunite

A. S. Nibecker, Jr., Architect
Ralph A. DeLine, Structural Engineer

Florence Avenue Elementary School

Although the remainder of the plant was so damaged that it was immediately torn down, the building which was added in 1932 and appears in the background at the right was undamaged

Theodore R. Jacobs, Architect

Barton Hill Elementary School

School completed in 1922. Unreinforced brick construction with high gables and stone ornaments. Building rehabilitated in 1936 by replacing exterior walls

Clement B. Lewis, Architect
Murray Erick, Structural Engineer

Miramonte School

In large elementary schools with a limited site, two-story buildings were found to be necessary. Miramonte School is typical of the two-story reinforced concrete construction

Carleton Monroe Winslow, Architect

Heliotrope Avenue School

Rehabilitated main building. The exterior and interior brick walls were reinforced with gunite

Joseph Kaiser, Architect
Paul E. Jeffers, Structural Engineer

Loma Vista School

Typical of the one-story frame-and-stucco construction used in elementary schools

A. S. Nibecker, Jr., Architect

Bell High School

When the administration building of this school was rehabilitated, the old exterior brick walls were completely replaced with concrete

Oliver C. Bowen, Structural Engineer
Robert F. Train, Architect

Horace Mann Junior High School

This concrete building, erected in 1926, withstood the 1933 shock without damage, although it was in an area where many buildings were injured

A. C. Zimmerman, Architect

John H. Francis Polytechnic High School

The new building, replacing the original Administration Building, of concrete heavily reinforced with steel. The compactness and simplicity of outline further increase the structural strength

Albert C. Martin, Architect

Tremendous progress has been made during the last two decades in scientifically improving technics governing construction of large civic-type and commercial buildings.

Many refinements may yet remain to be developed, but in general it may be said that buildings recently constructed or now in the process of construction are greatly superior in structural strength and fire resistance. Particularly is this true under the type of supervision that has prevailed in the present program.

Extent of the Program

Since the earthquake of March 10, 1933, 140 buildings have been demolished. Of these, 96 were in elementary schools, 12 in junior high school plants, and 32 in senior high schools. It has not been necessary to demolish many junior high school buildings, because the junior high school is the newest type of school and a majority of these buildings were of better construction.

One hundred ninety-eight buildings have been rehabilitated. Of these, 136 were in elementary schools, 27 were junior high schools, and 35 were senior high school buildings. One hundred seventy-one buildings have been constructed largely, though not entirely, as replacements of the demolished buildings. Of these, 101 are in elementary schools, 23 in junior high schools, and 47 in senior high schools. The number of new buildings in elementary schools is greater than the number of demolitions. In spite of this fact, there has been a very decided decrease in the number of rooms available for elementary schools, because the new buildings have been much smaller than those replaced. The typical elementary building is now of one-story construction, and frequently replaced buildings of two or two-and-a-half stories. There has been a very material reduction in the capacity of elementary schools corresponding to the decrease in the number of elementary children.

On the other hand, the program leaves the junior and senior high schools with a material increase in capacity. This program of expansion finds sufficient warrant in the increasing number of children in the junior and senior high school grades.

In addition to the figures quoted for schools which were in existence in March, 1933, the program includes five new junior high schools, three high schools, and one elementary school. On these new sites we will have 27 permanent buildings, in addition to a number of structures of a more temporary nature, making in all a total of 396 buildings authorized for rehabilitation or new construction in approximately two-and-a-half years.

Educational Improvements

The conditions under which the first building program was set up were not favorable to improvements in educational features of school buildings. The safety of children was of necessity the paramount issue, and the Board stipulated as a first condition that the maximum number of buildings must be rehabilitated in order to go as far as funds would permit in eliminating those buildings about which there could be question. In such rehabilitation little improvement was possible. As the program advanced it became apparent that in many cases replacement was in order rather than rehabilitation, and in such cases it was possible to develop plans more in accordance with modern educational trends.

Anticipating at least a certain amount of new construction, the Superintendent invited suggestions in regard to desirable modifications of the standard plans from teachers, principals, and all others who were interested in educational progress. These suggestions were reviewed by committees composed of teachers, principals, supervisors, and assistant superintendents. Probably the most significant change came in the development of a plan for a primary classroom better adapted to the activity program.

Modifications were made in plans for practically every other type of room and building. Most pronounced were the changes in facilities for physical education in junior high schools, for cooking laboratories in senior high schools, the enlargement of shop facilities to accommodate large class sections, and the development of a new type of auditorium. In very few cases was the total allotment of space increased. Better adaption of available space to present needs and practices was the goal rather than extensions which would necessarily increase cost and limit the program. The keynote of all changes was found in a general desire to provide larger working spaces by eliminating small rooms and by recessing cabinets and storage facilities. In all new rooms more liberal provisions have been made for storage of books and materials, and wherever possible such facilities have been recessed in the walls so as to leave the maximum amount of unobstructed floor space.

BUILDINGS AND EQUIPMENT FOR MENTALLY RETARDED CHILDREN

By ELISE H. MARTENS*

Senior Specialist in the Education of Exceptional Children,
Office of Education, Department of the Interior

DURING the past decade the importance of adjusting instructional procedures to meet the needs of individual boys and girls has been increasingly stressed in the general philosophy of American education. Inherent in this development has been the emphasis upon special facilities for mentally retarded children whose limited scholastic aptitude demands something different from the ordinary school curriculum. In 1922, the first year for which statistics on this subject are available on a nation-wide scale, 23,252 children were reported by city school systems as enrolled in special schools or classes for the mentally deficient. Each succeeding report period showed a substantial increase, until in 1936 the enrolment in such classes was 99,621. The conclusion to be drawn from a comparison of these figures is not that mentally deficient children have in these years become so much more numerous, but rather that school administrators have become more sensitive to their presence in the regular grades and to their need for special attention.

The provision of special facilities for any group of pupils always introduces problems of building and equipment. In the housing of special groups of mentally deficient children in city school systems, two general courses have been followed. In some cases an entire building centrally located draws from the surrounding elementary schools all the children who need the type of program it has to offer them. In other cases, special classes are organized in one or more of the regular elementary and junior high schools of the city and are considered an integral part of the particular school organization in which they are housed.

It is not the purpose of this article to present arguments for one or the other of these two procedures. Each has its advantages and its disadvantages. Both are being used successfully in different communities, small towns because of lack of numbers more frequently employing the special class, while large cities may much more readily establish the special school. While the isolation of handicapped children is being increasingly discouraged by students of the problem, this fact does not prevent the successful operation of segregated schools in certain districts where the program is directed efficiently and sympathetically. This article presents certain features of buildings and equipment connected with both types of provisions, showing desirable practices in the attack upon the problem as they have been followed in two specific cases, one a state school system and the other a city school organization. These two examples are typical of progressive programs which are under way for retarded children in various parts of the country.

Facilities of the Special Class

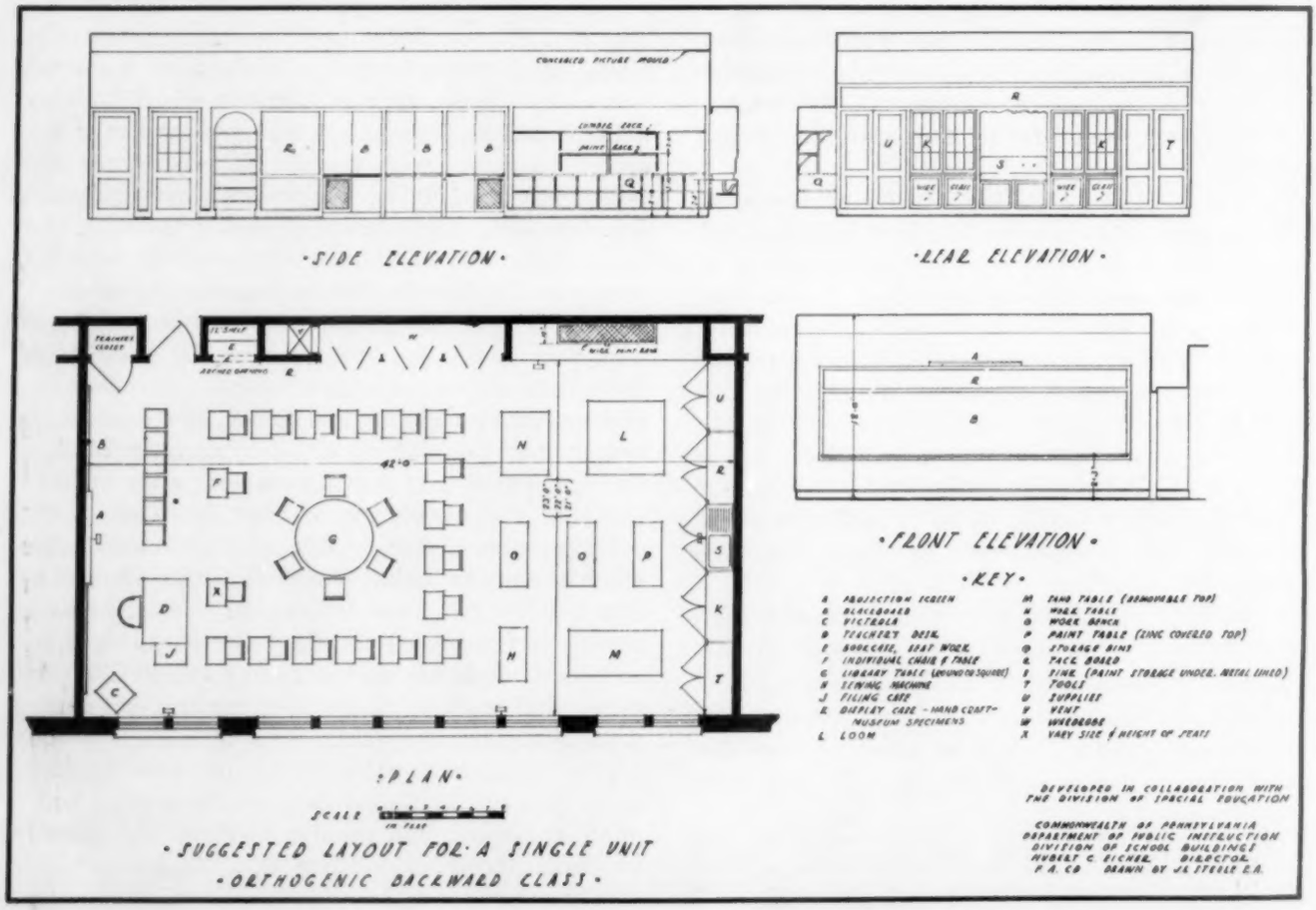
Frequently one finds special classes of mentally handicapped pupils housed in undesirable basement rooms or in some other part of the school building which is unattractive, poorly equipped, and even not lighted to a sufficient degree. In such cases the assumption seems to be that seriously retarded children have little appreciation for better facilities, and hence little need of those made available to other groups in the school. The fact appears to be overlooked that many of these pupils, because they come from poor homes and have little of the beautiful in their lives outside of school, should have all the greater opportunity to develop an appreciation of beauty in school. It is also frequently overlooked that malnutrition is prevalent among such children and that the schools should offer facilities for the development and maintenance of good health habits which the homes lack. Finally, children who are so retarded that they must be assigned to special classes should have provided for them the background for activities which are within their ability. The emphasis that must be placed upon manual experiences requires a generous apportionment of space to a well-selected equipment needed for this purpose. In short, every opportunity should be given to develop body, mind, and spirit, and suitable building equipment is no small factor in meeting this obligation which devolves upon the school.

* This article has been prepared with the assistance of Miss Edna Kugler, Adviser in Special Education, State Department of Public Instruction, Pennsylvania, and Miss Anna Engel, Supervisor of Special Classes, Detroit Public Schools, Michigan. These persons supplied the illustrations, diagrams, and some of the descriptive material used.

Standards for Special Classes in Pennsylvania

The Pennsylvania State Department of Public Instruction has developed standards for planning and equipping classrooms for backward children, in which the following are among the important items considered: (1) location of the room; (2) floor area; (3) type of equipment required; (4) storage facilities; (5) possibilities for attractive decoration. It recommends a location offering a generous amount of direct sunlight; adequate play area indoors and outdoors; facilities for personal hygiene, including hot and cold running water in or near the classroom, and showers and lavatories conveniently near; sturdy and durable tools and other materials for manual activities; closets, drawers, or other storage facilities for materials not in use; shelves, display cabinets, and bulletin boards; seatwork tables and filing receptacles; and as many appointments as possible to make the room an attractive place in which to live and to work.

The diagram given on this page shows the floor plan suggested and the placement of accessories deemed essential in the functioning of the class. Note the arrangement of the individual chairs, with the inviting library table in the center of the room; the sand table, the work table, the paint table, work benches, and sewing machine (at M, N, O, P, and H); the sink (at S); the storage bins, tool and supply closets, and display cases (at Q, T, U, and K); the bookcase (at E); the wardrobe (at W); and the projection screen (at A). The length of the room is 42 feet and its greatest width 23 feet. Since the maximum number of pupils to be enrolled in a special class is usually fixed at a much smaller figure than the enrolment of regular classes (in Pennsylvania at 18), a considerable part of the space that would otherwise be given to pupils' seats can be utilized for other purposes. In Pennsylvania, tables and chairs for individual pupils are suggested instead of the ordinary desks because table tops provide a far more satisfactory working surface and can be used for a larger variety of activities than the tops of desks or desk chairs. Moreover, individual tables lend themselves to better classroom organization and management than tables seating two or more. Strong well-made posture chairs with saddle seats are recommended. All tables and chairs should be equipped with domes of silence.



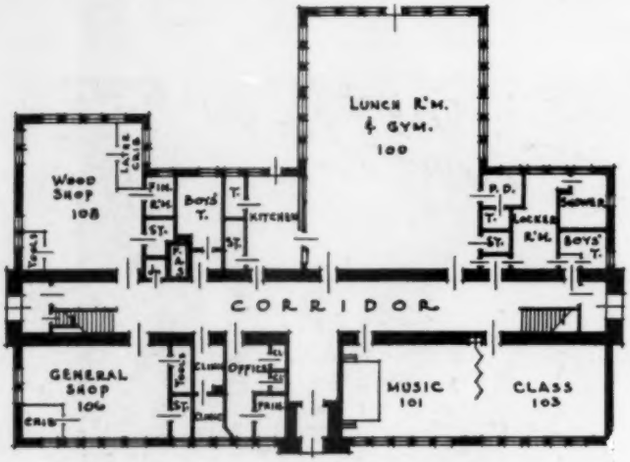
Space assigned to manual activities and homemaking instruction at a school in Northampton, Pa., which has two special classes for backward pupils. The homemaking unit is glimpsed through the arch at the right

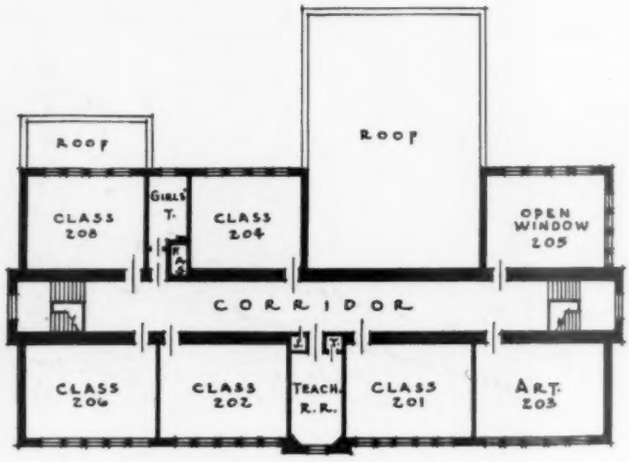
The further room of the homemaking unit is being used as a combined bedroom and sewing room

A table replaces the sewing machine, and a fireplace the bed, and the space becomes a living room

If two rooms of a school building are available for the use of a special class, one can be reserved for manual activities and special features of the class program, and the other room used for general class instruction. In Northampton, Pa., three rooms have been assigned for the use of two special classes organized in the same elementary school building. One room is employed for academic instruction; the other two have been thrown into one by completely removing the partition, and are used for joint assemblies and for manual activities. Since the resulting floor area is very large, it has been possible to construct a homemaking unit in one corner of the room without cramping the space allotted for handicrafts. In this unit there are two rooms separated by a large archway. One is equipped as a combination dining room and kitchen, the other as a modern living room and bedroom, with day-bed, open-shelf bookcases in two corners, table, chairs, taboret, sewing machine, and radio. In the kitchen are a reconditioned electric stove, and two attractive corner closets built and installed with the cooperation of the high-school instructor in manual arts and his students. The furnishing and decorating of the rooms were also cooperative projects in which the pupils of the special class had a prominent part. The construction of the exterior walls, the renovation, the redecorating of the walls, and the installation of permanent fixtures were all done by the janitor, at a cost of less than one hundred dollars. As shown in the pictures above, the set-up makes it possible to provide the proper setting for many different lessons in homemaking.

Below—The first floor, Jacoby Elementary School





Above—The second floor plan

Plans reproduced through courtesy of Department of Buildings and Grounds, Board of Education, Detroit, Mich.

The Special School

If an entire building is given over to the use of mentally retarded children, there is a resulting freedom in planning the school program without fear of conflict between the activities of regular and special classes. This fact has been one of several items considered as favorable to the establishment of segregated schools. Moreover, if the building is located adjacent to a regular elementary school, the objection that segregation in a special building brings isolation of the pupils enrolled is eliminated, since under such an arrangement there are many opportunities for community activities among the two groups of pupils.

Unfortunately, however, just as undesirable rooms within a building are sometimes assigned to special classes, so also one may find the most undesirable building of the city used for the "opportunity school," "adjustment school," or otherwise-named special school for retarded children. In several instances which have come to the personal attention of the writer, buildings so assigned have actually been unfit for occupancy by any group of children, lacking even adequate sanitary facilities. Having been discarded for use by the regular grades, they were appropriated for children who, coming in large numbers from poor foreign homes, with little understanding of American citizenship, needed more than any other group the opportunities that a well-built, well-equipped school plant could offer them.

In contrast to such cases, one can point also to instances of generous and understanding provision for retarded children in schools especially built for them. One of these instances is found in the city of Detroit, where both the special school and the unit of special classes within a regular school are utilized as the media of adjusting the educational program to the needs of pupils who cannot meet the standards of the regular classroom. The Jacoby School is one of six special schools in the city established for this purpose. It enrolls approximately 300 boys ranging in age from 12 to 17 years, and it stands on the grounds of an elementary building, sharing with it the use of the same heating plant.

The building is a modern two-floor structure of brick. Spacious halls, attractive doorways, linoleum-covered floors, and yellow glazed tile in the walls, are some of the features which attract attention in an initial observation of the plant. The shops and other special activity rooms occupy the first floor, while the second floor is used for general classroom instruction.

Closer examination of the room facilities which the building affords brings to light a well-equipped office, as well as an inner office for private interviews. Adjoining the office is a clinic room which may be used by the doctor, nurse, or psychologist. Instructional space includes six classrooms, an art room, a science room, a wood shop, a metal shop (including cement and shoe-repairing equipment), a music room, a gymnasium with lockers and showers, and a kitchen with connecting storerooms and wash rooms. All the rooms are well-lighted and are amply equipped with blackboard space and cupboard facilities as needed. A rest room for the teachers occupies space on the second floor.

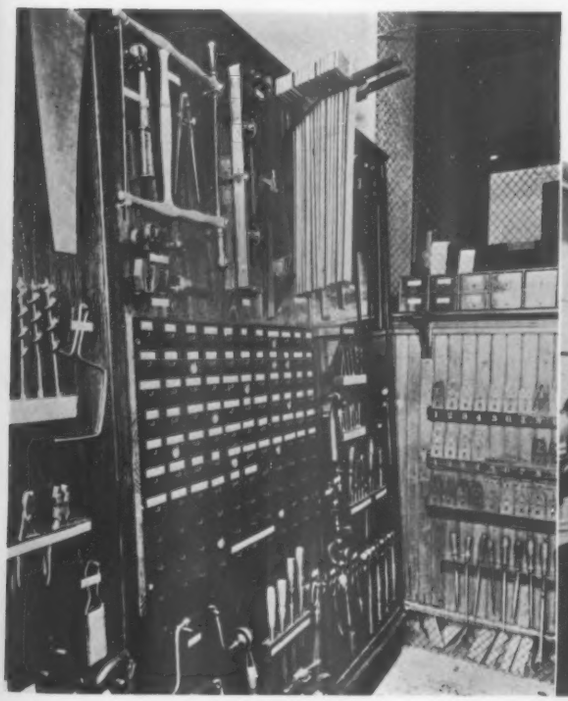
The music room becomes an auditorium when it is enlarged by opening fold-away doors into the adjoining classroom. A small stage is built at one end. The gymnasium becomes a lunchroom at noon, when built-in wall tables are released and chairs are brought in from the storeroom. When these tables are again locked in place, the gymnasium program is resumed.

Above—The music room becomes an auditorium when fold-away doors are opened into the adjoining classroom. There is a small stage at one end of the room

Below—Modern equipment in the kitchen includes an electric refrigerator and a dishwashing machine. The boys learn to prepare their own lunches, which are served in the adjoining cafeteria-lunchroom

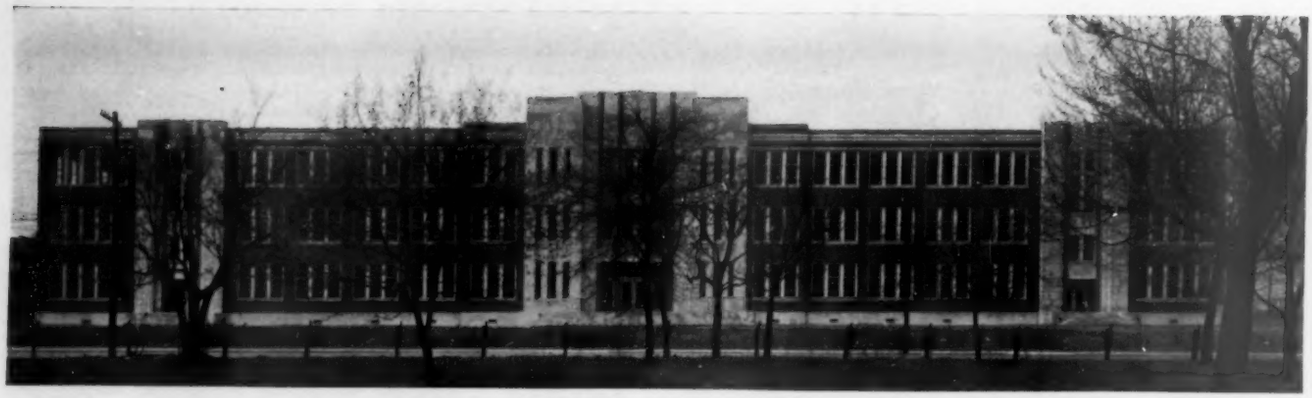
One of the most interesting centers of activity in the building is the kitchen, which adjoins the gymnasium-lunchroom and in which the boys learn to prepare and to serve their own lunches. It has modern equipment, including an electric refrigerator and a dish-washing machine. Floor and walls are of tiles, and the appearance of the whole room is one of immaculate—and attractive—efficiency.

The Jacoby School provides a coordinated program of vocational training, health education, and academic instruction. Through daily experiences in healthful living, physical training, manual activities, and competitive games, it encourages in the boys sound habits of physical development. Through its total offerings it stimulates worth-while habits of work, as well as desirable attitudes and behavior, which are essential for an adequate social adjustment. Important items contributing to the desired results in the lives of these boys—and of all mentally retarded pupils—are the building and the equipment furnished for their instruction under the guidance of well-prepared, understanding teachers.



Left—A well-equipped shop demands an ample supply of tools

Below—A challenging program of shop activities holds the boys' interest at Jacoby School



The Pearl High School, Nashville, Tenn.

NASHVILLE'S NEW NEGRO HIGH-SCHOOL PLANT

By CALVIN L. McKISSACK

Architect, Nashville, Tennessee

ONE of the recent additions to the excellent equipment and unusual facilities for the educational development of Negroes in Nashville is the new Pearl High School plant. Nashville is known far and wide as an educational center for Negroes as well as whites. Fisk University, Meharry Medical College and A. and I. State College are nationally known educational institutions for Negroes. Young men and women have gone from this community well trained, and well prepared to meet the ever increasing demand of a new and complex civilization. In such an atmosphere nothing less than an adequately planned school plant would satisfy the ambitions, hopes, and aspirations of the community for the educational opportunities of its Negro youth.

This educational plant is the result of many successive stages in the development of public education for Negroes in Nashville, each of which expresses itself in permanent form, and reflects the social needs and the curricula of a particular period. Each school board built in terms of needs and ideals of its day, and each successive stage was dedicated to useful service. The development of the curriculum may be seen in the plans of the school plants erected at various periods in the progress of public education. Those responsible for the new Pearl High School plans do not believe that they have reached perfection, but hope that this plant will adequately house the educational program of the present, and that it is sufficiently flexible to permit of future alterations to meet changing conditions.

Immediately following the war between the states, public education in the South was in a chaotic condition. Handicapped by lack of money and a trained teaching staff, progress was slow. There were certain prevailing opinions and social customs which made it necessary to set up a dual system of schools, which was not only expensive but difficult to administer.

In the year 1877 there was some talk of a high school for Negroes, but it did not materialize until 1884, when the first public high school for Negroes in Nashville was established in the Edgefield section. The building bore the name of James I. Meigs, a former city superintendent of schools.

In the year 1887 the high school was moved to a more central location on Fifth Avenue South and named in honor of the late Joshua Pearl, first superintendent of the Nashville Public Schools. This building served its purpose for thirty years. In 1917 the Pearl High School was rehoused by a new structure on Sixteenth Avenue North, in the vicinity of Fisk University. For twenty years this plant did service, but became entirely inadequate both in size and facilities for a modern educational program.

The new Pearl High School plant, completed in 1937, is the outgrowth of two factors: first, as an aftermath of the financial depression beginning in 1929 a building program was instituted to stimulate industry; second, in the building program it was proposed to carry out the findings of a school survey made by the Division of Surveys and Field Studies of George Peabody College. The survey pointed out many defects in the physical plant of the Nashville public schools, both white and Negro, and the taxpayers voted bonds for the erection of much-needed school buildings.

Typical classroom

Machine and forge shop

Typical corridor

The cafeteria

The library

Commercial classroom

The new Pearl High School for Negroes is designed to accommodate 1,200 pupils. The site is well located with respect to the Negro population, a Negro park, the two-million-dollar Federal Housing Project for Negroes, Fisk University, Meharry Medical College, and the A. and I. State College.

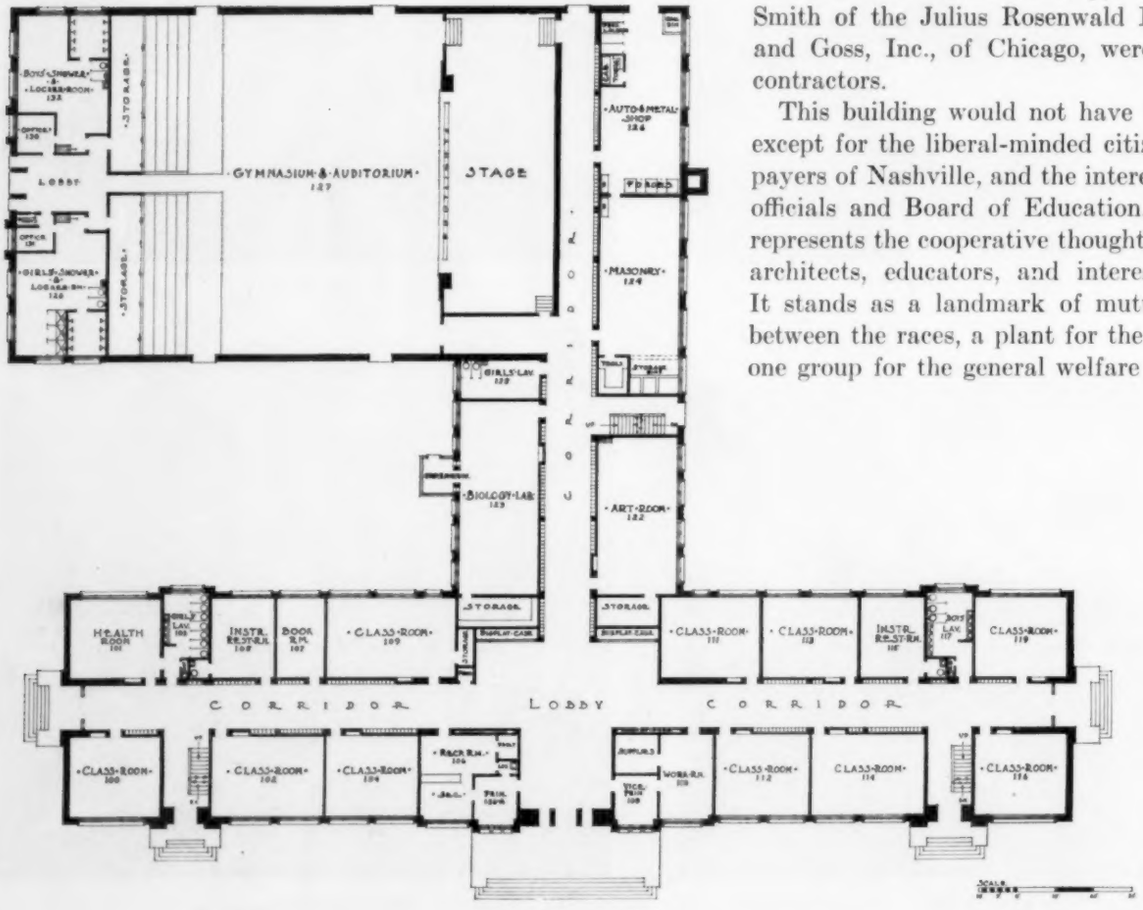
Room Arrangement for a Modern Program

Nashville's new Negro high school was planned to house a modern secondary school program. It contains laboratories for biology, physics, chemistry, bookkeeping, typing, foods, and clothing; and shops for auto mechanics, metal work, masonry, and woodworking. Special rooms are provided for mechanical drawing, fine arts, and a model apartment. Music has received special attention in this plant. There is a large chorus room, practice rooms, an instrument room, and a music library. The entire plant was designed around the library as the central unit. Study halls were omitted, but the cafeteria dining room was placed next to the library so that it may be utilized as an auxiliary reading room. The plant provides adequate, well-lighted sanitary facilities well distributed throughout the building, and the necessary offices, rest and health rooms, and work rooms for the administration of the school. In order to provide adequate gymnasium and assembly facilities, it was necessary to combine these two large areas. The regulation playing floor has a 30 x 80-foot stage on one side and 800 stadium-type seats on the other. The area beneath the permanent seats affords adequate space for physical education lockers and showers for both boys and girls. By placing folding chairs on the playing floor to supplement the permanent raised seats, a 1,500-capacity audience may be seated facing the stage.

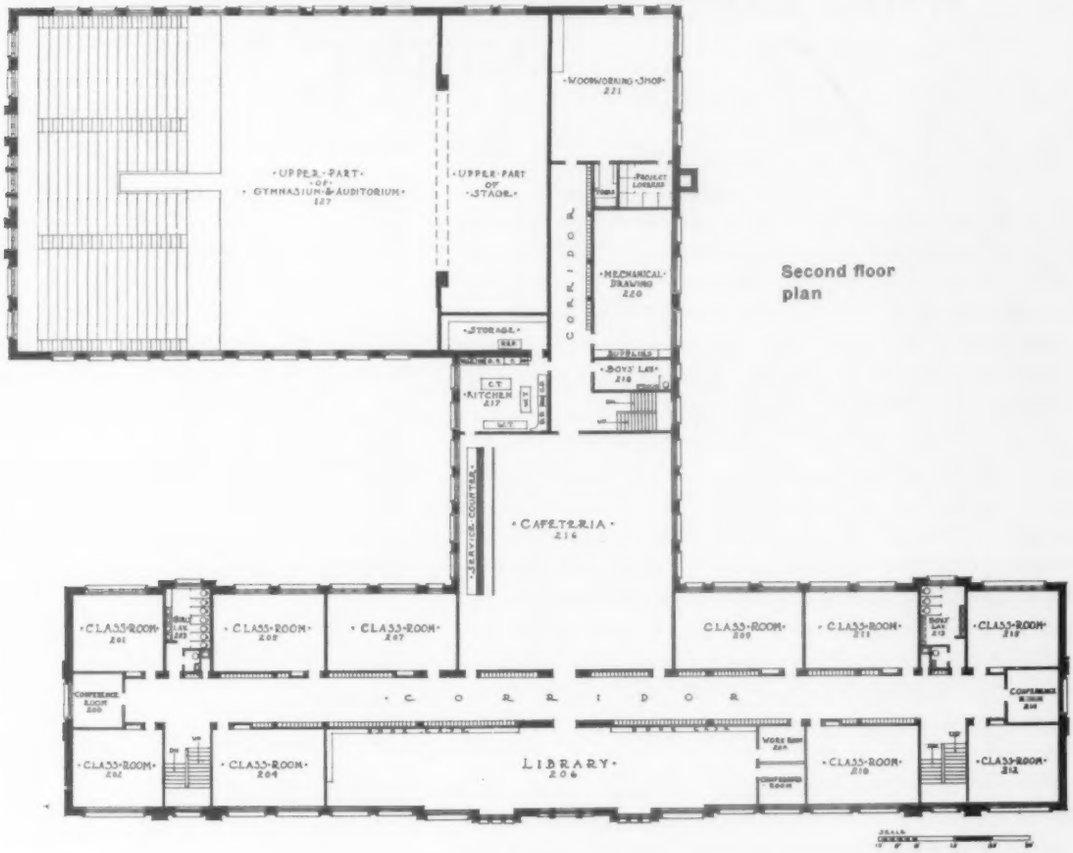
There is ample room for an athletic field and play areas. The building itself is of fire-resistive construction. The frame is of reinforced concrete, with walls of brick trimmed with cut stone. The classrooms have maple floors, and the corridors and toilets are floored with tile or terrazzo. Individual metal lockers are built in the corridor walls.

The Pearl High School building was designed and supervised by McKissack and McKissack, Negro architects of Nashville. The plans for the school were checked for educational adequacy by Superintendent H. F. Srygley, Prof. Ray L. Hamon of George Peabody College, J. C. Calhoun of the Tennessee State Department of Education, Prof. Harold F. Smith of Fisk University, and Dr. S. L. Smith of the Julius Rosenwald Fund. Coath and Goss, Inc., of Chicago, were the general contractors.

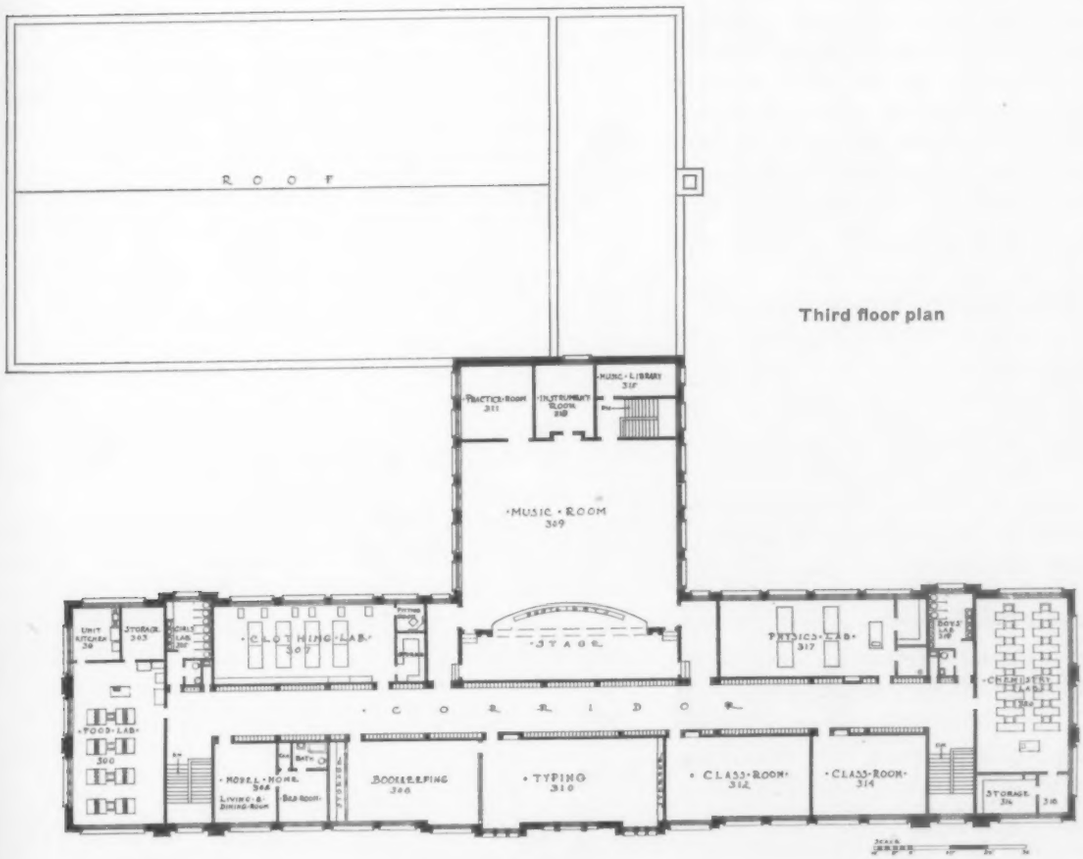
This building would not have been possible except for the liberal-minded citizens and taxpayers of Nashville, and the interest of the city officials and Board of Education. This plant represents the cooperative thought and effort of architects, educators, and interested citizens. It stands as a landmark of mutual good-will between the races, a plant for the education of one group for the general welfare of all.



First floor plan



Second floor plan



Third floor plan

WHAT CONSTITUTES ADEQUATE CLASSROOM LIGHTING

By W. G. ECKLES

Director, School Building Service, State of Mississippi

GOOD lighting makes for efficiency in school. On the other hand, poor lighting not only reduces school efficiency, but causes physical discomfort and often results in permanent injury to the eyes. It is therefore very important that adequate lighting be provided for school work.

For several decades schoolhouse planners have given much attention to the problem. Significant experimental research has been done on it. Every important set of school-plant standards developed in recent years has contained items for the purpose of providing "adequate lighting." During the past few years commercial agencies have been interested in lighting problems. There has been such a campaign waged to make John Citizen, his wife and children light-conscious that interest in lighting has reached a new high.

The lighting problem lends itself to analysis. The seeing process is a partnership of two essential factors, vision and lighting. It is necessary to have eyes capable of vision and it is just as necessary for those eyes to have light by which to see. The eye specialist is definitely limited in what he may do to improve the capacity of the eye to see. On the other hand, it is possible to control lighting in every essential respect. It is possible not only to control the quality and quantity of light, but to control the light supply which has been made available. Quality, quantity and control are the three important elements of the problem.

Quality of Light

Natural light or sunlight is best for ordinary eye tasks. Artificial light which approaches sunlight in spectral quality has been found most satisfactory for the usual tasks. Even appreciable variations in the spectral quality of light have little effect upon the clearness or quickness of vision. However, some specialized tasks, such as certain work with colors, demand a definite spectral quality of light.

Quantity of Light

There has been experimental research to determine light intensities needed for various tasks. Dr. Frank N. Freeman's work "to determine how much light is necessary or desirable for reading" [1] is one of the most significant researches reported. After studying the reading efficiency of adults and children, Dr. Freeman concluded that "reading efficiency is increased with increased illumination up to *3 foot-candles*, and very little if any increase in reading efficiency is accomplished by increased illumination *above 3 foot-candles*." He recommended that, because children in school often do not get all available illumination on their work, *5 foot-candles* of light should be available to them. This recommendation was made after a study of the effect of various intensities of light on clearness of vision, speed of reading and eye fatigue.

The recommended values of illumination for school interiors in Standards of School Lighting,[2] the official American Standard, follow:

Location	Foot-Candles Recommended
Class A—Sewing rooms, drafting rooms, art rooms and rooms where fine detail work is to be done—on the work	15–10
Class B—Classrooms*—on the desks and blackboards; study halls and libraries—on desks and tables; shops, manual arts and vocational training, laboratories—on the work; gymnasia—main exercising floor, basketball, handball, boxing, wrestling; playrooms, swimming pools	12–8
Class C—Auditoriums, assembly rooms, cafeterias and other rooms in which pupils congregate for extended periods but not used for study	5–3
Class D—Recreation areas, locker rooms, corridors, stairs, passageways, toilets	4–2

* For sight-saving classes, of pupils with markedly subnormal vision, these values should be materially higher.

It is suggested in these standards that appreciably higher values of illumination are recommended for sight-saving classes. An intensity of at least 30 foot-candles was recommended for sight-saving classes by a committee appointed to study the problem by Dr. Bowsher of Ohio. "Standards of School Lighting" includes the most thorough treatment of the whole lighting problem yet developed.

Dr. H. D. Worthy [3] reports that only myopic eyes increase in reading efficiency as illumination is increased above 5 foot-candles. He reports further that hypermetropic eyes decrease in efficiency as illumination is increased above 5 foot-candles. Dr. Worthy's tests were confined to the use of three intensities of light—5, 15 and 85 foot-candles. He concluded by recommending an intensity of 15 foot-candles for classrooms.

[1] Committee on Schoolhouse Planning, N.E.A. 1925, pp. 90-121.

[2] "Standards of School Lighting," Illuminating Engineering Society and A.I.A., 1932, p. 13.

[3] Worthy, H. D.: unpublished Doctors Thesis, New York University.

Among the most prominent of those who have engaged in experimental research at the instance of commercial agencies are Luckiesh and Moss, with the General Electric Company. They recommend the following light intensities for various tasks:

100 foot-candles or more—for very severe and prolonged tasks, such as fine needlework, fine engraving, fine penwork, fine assembly, sewing on dark goods, and discrimination of fine details of low contrast, as in inspection.

50 to 100 foot-candles—for severe and prolonged tasks, such as proof-reading, drafting, difficult reading, watch repairing, fine machine-work, average sewing and other needlework.

20 to 50 foot-candles—for moderately critical and prolonged tasks, such as clerical work, ordinary reading, common benchwork and average sewing and other needlework on light goods.

10 to 20 foot-candles—for moderate and prolonged tasks of office and factory, and when not prolonged, ordinary reading and sewing on light goods.

5 to 10 foot-candles—for visually controlled work in which seeing is important, but more or less interrupted or casual, and does not involve discrimination of fine details or low contrasts.

0 to 5 foot-candles—the danger zone for severe visual tasks, and for quick and certain seeing. Satisfactory for perceiving larger objects and for casual seeing.[4]

Control of Light

It must be remembered that in each instance of the foregoing recommendations, it was assumed that there would be efficient control of the light recommended. Given a sufficient intensity of light, glare is probably the greatest handicap to vision. Glare has been defined as "any brightness within the field of vision of such character as to cause discomfort, annoyance, interference with vision or eye fatigue." Direct glare may be experienced by looking at a window opening toward bright sky. Glossy finishes, glazed paper and shiny desk tops cause reflected glare. The elimination of glare presents an all-important problem in the control of classroom lighting.

While standards have been a tremendous influence in improving classroom lighting, they have not solved the problem. Additional research is needed to more definitely determine the degree of illumination needed for school tasks. Various effects, physical and psychological, of different intensities and other properties of light should be studied. However, the following suggestions are made in the belief that each will contribute to a situation of adequate classroom lighting:

1. There should be an adequate light supply in all parts of the classroom, especially at each pupil station.
2. The light supply should approach sunlight in spectral quality.
3. There should be a minimum intensity of 10 foot-candles at each pupil station.
4. Glare should be entirely eliminated or at least reduced to an absolute minimum.
5. Sunlight should be used to as great an extent as possible.

[4] Luckiesh, Mathew and Moss: "The New Science of Lighting," General Electric Company, 1934.

Natural Lighting

For good natural lighting it is suggested that:

1. All windows should be on one side of the room.
2. The distance from the floor to the top of the window opening should be at least one-half the width of the room.
3. There should be no windows within 4 feet of the front wall of the classroom.
4. Windows should be so placed that no light will be admitted below the eye level of pupils at their working stations.
5. Windows should extend well toward the rear of the room, and at least beyond the pupil station nearest the rear wall.
6. Within the four limits described, there should be as much glass area as possible. The more glass area, the more useful sunlight will be admitted.
7. Windows should be glazed with clear glass, which should be kept clean to admit the maximum of light.
8. Windows should be equipped with translucent shades, adjustable by lowering from the top and by raising from the bottom of the window. A very satisfactory diffusion and distribution of sunlight has been accomplished with venetian blinds of the proper type and color.
9. All surfaces on walls, furniture, etc., inside the classroom should have a dull finish which will not produce glare.
10. The ceiling color should have a reflection factor of at least 75 per cent.
11. The wall color from the ceiling to a level approximately 42 inches above the floor should have a reflection factor of from 50 to 60 per cent.
12. The wall color from the floor to a level approximately 42 inches above the floor should have a reflection factor of not more than 45 per cent.
13. The desks or tables and chairs should be so arranged that no pupil must face the windows. Desks arranged in rows parallel to a line from the left rear corner of the room to the right front corner of the room have been found very satisfactory. When the desks are arranged in rows parallel to the long axis of the room, those pupils who are seated in the right rear corner of the room are bothered with glare from the windows toward the front of the room.
14. Omission of blackboards from the wall opposite the windows may increase substantially the light on that side of the room.
15. East-and-west orientation is preferred for usual classrooms.
16. Outside the building there should be no surfaces that will produce glare inside the classroom, and there should be no obstructions which prevent sunlight from entering the windows.

Artificial Light

Overcast skies, climatic and other conditions, often greatly reduce the supply of natural light. When the supply of natural light is insufficient, artificial light should be used to supplement natural light up to the suggested standard.

Indirect artificial light reflected from the ceiling is the most satisfactory. A sufficient number of fixtures should be installed, and they should be so located as to make the light supply at desk or table top height reasonably uniform. Two rows of three or four fixtures parallel to the long axis of the room, one row approximately two-thirds the distance from the windows to the opposite wall, and the second row spaced between the first row and the windows, are frequently used. It is very important that fixtures be of such type as to produce no glare. For economy, it is suggested that a separate circuit be used for each row of fixtures. Very often when sunlight is not sufficient on the dark side of the room, the circuit on this side of the room will boost the light supply sufficiently without the use of the other circuits.

During the last few years, many schools have installed an automatic control for the artificial light supply. The photo-electric cell has been used to cut the lights on and off as the supply of natural light fluctuated. This type of equipment offers splendid possibilities in improving classroom lighting, but early installations have not been without fault. Administrators and classroom teachers have complained that the lights flashed on and off so frequently at times that it was very annoying. One school was visited where the equipment had been disconnected to eliminate this annoyance. It seems that the relay control system would be much more satisfactory if it were so designed that it would maintain a minimum light supply in all parts of the classroom by a gradual increase in intensity of artificial light with the decrease in the intensity of natural light. If it would then boost natural light only in that part of the room needing additional light, light would not only be more uniform but current would be conserved.

A properly planned classroom does not itself insure adequate lighting. The use of the classroom may be and often is the determining factor in the success of classroom lighting. The child's ability to see must be considered. Simple eye tests such as may be administered by the school nurse, or even the classroom teacher, should be given each school child. Equipment such as the Opthalmic Telebinocular manufactured by the Keystone View Company has been used successfully in detecting such defects as myopia, hypermetropia and astigmatism. Defective eyes should have a physician's care. The classroom teacher should know of the child's handicap so that she may cooperate with the physician and the child's parents.

Subnormal vision should be considered in assigning stations to pupils. It is suggested that children with myopic eyes be seated near the windows toward the front of the classroom. Children with hypermetropic eyes may be seated toward the rear of the room, while children who suffer from astigmatism probably should be seated near the windows. Sight-saving classes should be organized for children having eye conditions which make it advisable for them to have special consideration.

After the children are seated to the best advantage in a carefully planned classroom, the lighting may still be very unsatisfactory because the teacher does not turn the lights on or does not keep the window shades properly adjusted. How often the lights are found on with the shades drawn or at least covering the upper half of the windows. All the efforts of the careful schoolhouse planner and the cost of expensive features in the building are too often spent in vain because of the misuse or the neglect of the teacher to make proper use of the facilities provided. When school administrators and classroom teachers become sufficiently light-conscious to recognize their responsibility for the physical comfort and well-being of school children by the proper use of the well-planned classroom, especially by keeping the window shades properly adjusted, then, and not until then, we may have adequate classroom lighting.

SCHOOL VENTILATION

By A. R. ACHESON

Professor of Mechanical Engineering, Syracuse University

YEARS ago ordinary window ventilation was found inadequate for crowded classrooms, and mechanical systems of ventilation were introduced. At first, owing largely to faulty design, the results were often unsatisfactory. Complaints were made of noise, drafts and poor control of volume and temperature, and after a brief trial period it was not unusual to find the window system again being used and the mechanical equipment lying idle. Since those early days it has been found that good design and reasonably careful operation can overcome such troubles entirely. Today, therefore, engineers specializing in this kind of work can guarantee a first-class ventilation system, with the result that the more recently installed systems are being kept in operation and are paying dividends in improved pupil performance and more healthful conditions.

Mechanically Operated Systems of Ventilation

In New York State today practically all ventilation systems are mechanically operated and may be classified under two main headings: (a) central fan systems; (b) unit ventilator systems.

The central fan system is the oldest system and is used in many forms, chief of which are as follows:

1. Central fan—*hot-blast* system

(a) With central heating coil; double ducts and no direct radiation. (See Fig. 1.)

(b) With central heating coil; single ducts and no direct radiation.

(c) With central tempering coil, single ducts and booster coil, and no direct radiation.

2. Central fan *"split"* system, using tempered air for ventilation and some heating, plus direct radiation for supplementary heating.

Central Fan-Hot Blast System.—Systems 1 (a), (b), and (c) give about the same results and we will describe system 1 (a) only.

The central fan hot-blast double-duct system was largely used throughout New York State thirty-odd years ago. This system of ventilation is indicated in Fig. 1. The central fan (A) takes air from a fresh-air shaft (B) through a tempering coil (C) and blows part of the air through a heating coil (D) and part through a by-pass (E) underneath the coil. The two ducts (F) and (G) carry warm air and cool air respectively to a mixing damper (H). The position of the mixing damper is varied to control the amounts of warm and cold air that are mixed before entering the classroom, thereby controlling the temperature in the room but still furnishing the full quantity of air. This mixing damper is operated either by hand or by a thermostat in the room.

Two main troubles are experienced with this system. First, the operation of the mixing damper is somewhat uncertain, since it is operated by an inter-

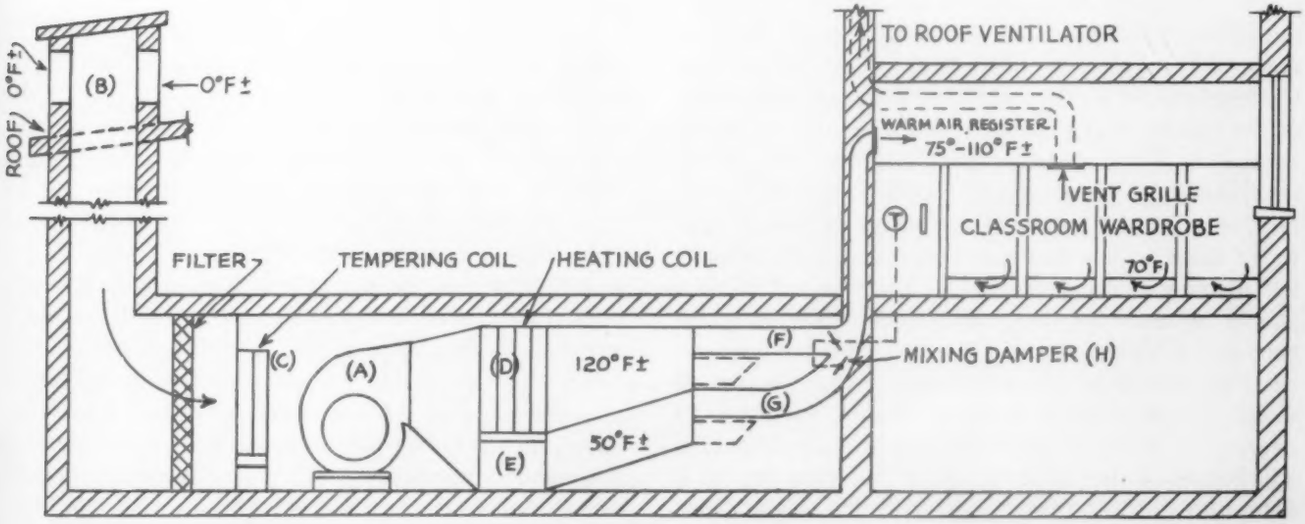


Fig. 1—Diagram of central fan—hot-blast—double-duct system of ventilation

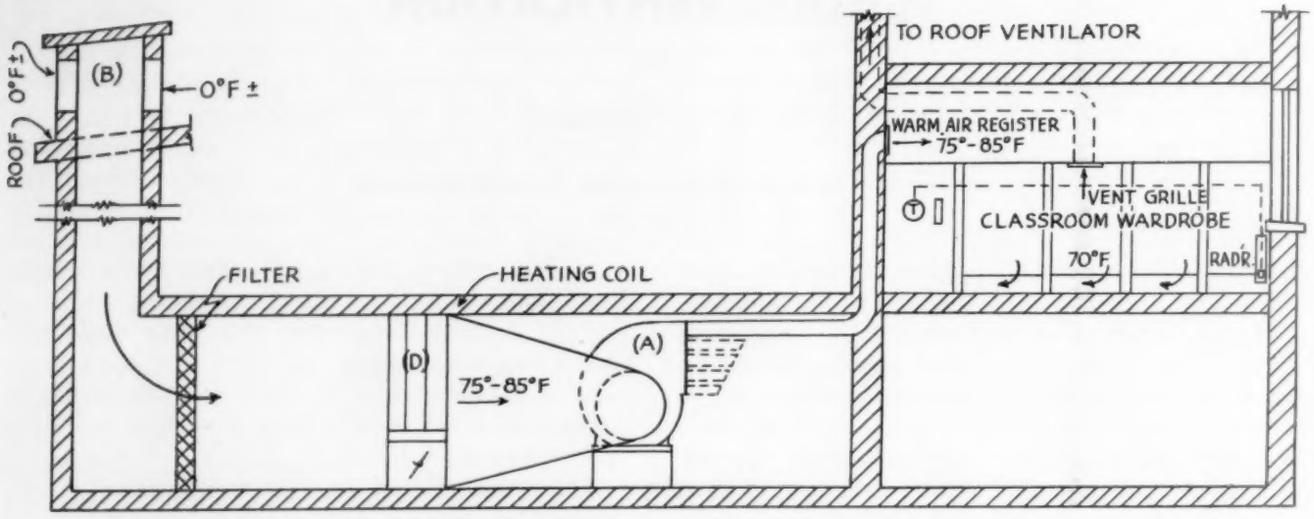


Fig. 2—Diagram of central fan "split" system of ventilation

mediate thermostat or by hand. If the damper sticks and does not take the right position, the temperature of the mixed air is either too hot or too cold and the system gives poor results. In practice it has been difficult to maintain a double-duct system in good operating condition, especially when the mixing dampers are difficult to reach. Second, there being no radiators under the outside walls, the chilling effect of these cold walls is objectionable. Hence, it is not surprising to find that this double-duct system has been largely replaced by the "split" system.

Central Fan "Split" System.—In the "split" system, shown in Fig. 2, fresh air is drawn from the fresh-air shaft (B) through a heating coil (D) by the fan (A) and forced into all the classrooms at a common temperature, usually from 75 to 85 degrees. This process is called "tempering the ventilation air." In mid-winter in northern latitudes this air is not warm enough to provide all the heat required in the room. The extra heat required is furnished by direct radiators (RAD'R.) which are located under the windows. This system is called a "split" system because the functions of heating and ventilating are split, most of the heating being done by direct radiators and the ventilating being done by the tempered air. However, the name is somewhat of a misnomer because in mild weather the tempered air brings in enough heat to do most of the heating, and the direct radiators are on only a small portion of the time. Provision should be made for easy adjustment of the temperature of the tempered air. In severe weather the temperature should be carried relatively high, say at 85 to 90 degrees, whereas in mild weather, say 72 to 75 degrees, or lower if necessary to prevent overheating. The length of time that the direct radiators are on is determined by the room thermostat, and so the direct radiation may be considered to be the control equipment which determines the temperature in the room. This method of controlling the temperature has proved, in general, more reliable than the method using a mixing damper in a double-duct hot-blast system.

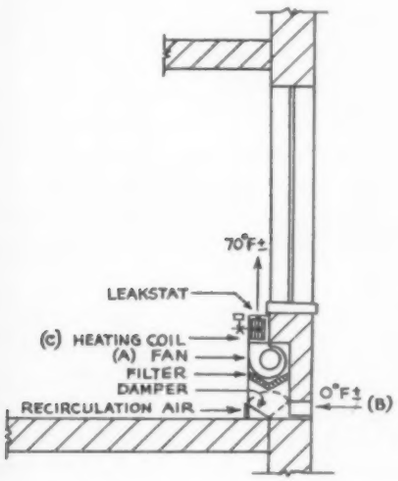
An additional advantage of the direct radiation is that it is available for heating the room when the fan system is shut down after school hours or during emergencies. In case of a failure of the electric supply, it is possible to heat rooms provided with the usual amount of direct radiation, on all except extreme days, by the direct radiation alone. This feature will sometimes prevent dismissing school. It can safely be said that the majority of engineers prefer the split system of heating and ventilation in school buildings as compared with the hot-blast system owing to warmer outside walls, to the better temperature control, and to the fact that the air is not heated to as high a temperature in the split system as it is in the double-duct system.

Unit Ventilator System.—The unit ventilator system is shown in Fig. 3. Each classroom has a unit ventilator with a small fan (A) which takes air directly from outdoors (B) and blows it through a heating coil (C) into the room. The room thermostat either controls the amount of steam to the coil or by-passes some of the cold air around the coil, thereby controlling the temperature of the air going to the room. The fan, its motor and the heating coil are housed in a neat cabinet, and the outfit is called a unit ventilator. Modern unit ventilators have a device called a leakstat to prevent air from being blown into the room at too low a temperature. They also have controls to recirculate the air from the room until the room temperature reaches 70 degrees F. or any other pre-set temperature, after which time fresh air only is admitted.

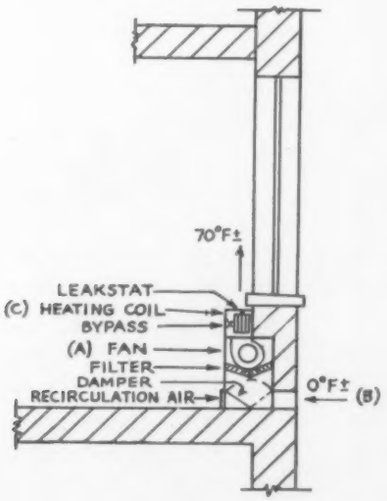
In comparing the merits of the central fan and unit systems, a number of factors must be carefully considered. Since a central fan system requires a tremendous amount of galvanized iron duct work, the unit ventilator system appeals as offering a saving due to omission of ducts. This saving in installation cost, however, is more than offset by the added cost of the unit ventilators and of the longer and larger steam piping, extra cost of temperature control, pipe covering, etc. For the same design conditions, therefore, the unit ventilator systems will cost approximately 10-15 per cent more than the central fan systems. Furthermore, over the same period of operation, the cost of operating is greater for the unit system than for the central fan system, because the small units, small motors and small fans in the unit system are not as efficient as a large central fan and motor. Yet, when due cognizance is taken of the space required for central fans and the central fan duct system, and the bearing that this has on the total costs, the decision is often in favor of the unit system. As a matter of fact, in recent years the unit system has been more commonly adopted than the central fan system.

Unit systems, like the early central fan systems, have sometimes been unsatisfactory owing to noisy operation, cold drafts and improper temperature. Some of the manufacturers have tackled these problems, and now produce units which are reasonably quiet and in which the temperature control and air distribution are satisfactory, although in some cases trouble still exists unless the units are run at reduced capacity.

There is no fundamental reason why the unit ventilators cannot be built to give quiet operation and better temperature control, and we understand that marked improvements along these lines will be demonstrated in the near future. Since all central fan systems are not free from these troubles, greater care should likewise be taken in their design to eliminate noise and to give better distribution of the air and more sensitive control of the temperature than is commonly being done.

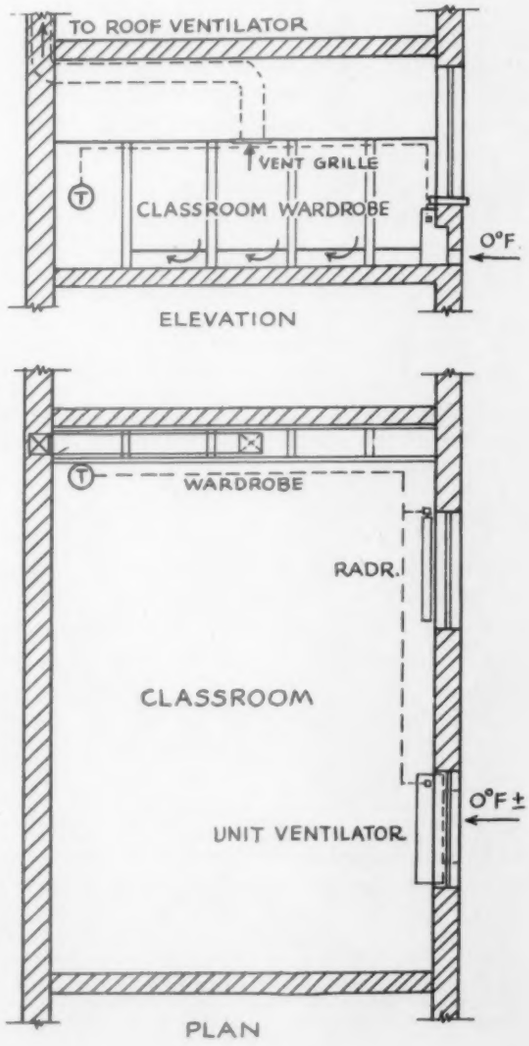


Above—Fig. 3—Elevation of radiator-controlled unit



Right—Fig. 4—Elevation of a bypass unit

Right—Fig. 5—Diagram of unit ventilator system



It is well to remember that the unit ventilator system has the distinct advantage of permitting the regulating of the temperature of the incoming air for each individual room according to the room conditions. This is a decided advantage when a certain amount of cooling is needed to offset sun exposure.

Window Ventilation.—This system was revived a few years ago, and very properly it had a short life. It is well for the layman to realize that window ventilation for schools has been thoroughly tried and has been found ineffective.

Requirements of a Modern Ventilating System

A modern school ventilation system should incorporate the following features.

Filtering.—The air supply should be filtered, at least in all city schools. Any air which is recirculated should be filtered, regardless of whether it is in a city school or in a country school. More dust is taken from the recirculation air than is taken from the outside air. Easy removal of filter units for cleaning or replacement is imperative, or the filters should be of the continuous self-cleaning type. It is better to have no filter than a clogged filter. Filtering can be more readily taken care of in central systems than in unit systems. Serious experiments with electric precipitation of dust particles are being conducted.

Temperature Control.—It is customary to regulate automatically the temperature of the ventilation air and the operation of the direct radiators. Automatic temperature control is an essential in modern schools. The temperature control equipment is self-liquidating in approximately eight years owing to fuel saving, but, regardless of this good feature, temperature control should always be installed to ensure the improved work and health conditions that result from maintenance of the proper temperature in the schoolroom.

Here we should like to call attention to the trouble which is caused by the reiteration in current literature, textbooks, etc., that 68 or 70 degrees is the proper temperature to maintain in a classroom, with no reference to effective conditions. These temperatures are proper only when the incoming air is artificially humidified. Common observation is sufficient to show that a temperature of 70 degrees or lower is too low in classrooms in the latitude of New York State, in freezing weather. If school principals will adopt the practice of prescribing 72 or 73 degrees as the optimum temperature in freezing weather or lower to be maintained on thermostats which are set approximately 4 feet, 6 inches above the floor on inside walls, they will put an end to many of the complaints about cold rooms and cold drafts in classrooms. We hesitate to recommend prescribing proper clothing of teachers and pupils. Variation in clothing too often makes it impossible to give universally satisfactory temperature control.

Air Distribution.—In general, all systems should direct the ventilation air to the ceiling of the classroom, so that the air will be well distributed and will not fall at high velocity on the occupants. Throwing the air upwards from a unit ventilator is a good feature. In central systems the tendency should be to use several fresh-air inlets (discharging upwards) instead of one or two large inlets, and the use of directional grilles is to be recommended, to give better distribution of the air. A moderate amount of air motion is desirable.

Humidification.—Humidification of the air in winter is desirable. In some schools equipped with humidification systems trouble has arisen owing to poor control of the amount of humidification. Excessive humidification is just as harmful as too little humidification. In general, the humidity in classrooms is not excessively low, largely because of the amount of moisture given off by the occupants, and if the proper room temperature is maintained, comfortable conditions are usually found in a well-ventilated schoolroom without resorting to artificial humidification. This is not saying that well-controlled humidification would not be an improvement. It is simply saying that the humidity without artificial humidification in average classrooms in the latitude of New York State is not a serious problem. Reference is made to the humidity in the winter heating season only. Humidification with unit ventilators is not satisfactory.

Recirculation.—It is well known that it requires a considerable amount of coal to heat the fresh air that is furnished to a school building, and that much less coal is required if inside air is recirculated. Consequently, there is always a marked demand for systems that will permit recirculation. Unit ventilators are now usually built so that any desired percentage of the air may be recirculated during school operation, and the same operation can be obtained with the central fan system. Some states permit a certain percentage of air to be recirculated even during school periods, but the state of New York does not permit such recirculation.

This brings up the question of how much air is required for good ventilation conditions. A brief answer is that sufficient *fresh* air should be admitted to keep the odors in the room down to a reasonable condition, and sufficient *total* air should be admitted to the room to provide reasonable circulation in the room. It is generally accepted that under no conditions should the amount of fresh air be less than 10 cubic feet of air per minute per occupant. Our observation is that this quantity is entirely inade-

quate for school ventilation, and we believe it is generally accepted that at least 20 cubic feet of fresh air should be admitted per pupil. The writer prefers 25 cubic feet during school operation. Our experience is that odors become disagreeable if less than 20 cubic feet of fresh air is admitted to the schoolroom per pupil per minute. There is plenty of oxygen with 10 cubic feet, but the extra amount of air is needed to dilute the odoriferous air and to give proper distribution.

In passing, we might mention that it is not good policy to design school ventilation systems for weather conditions such as we have in central New York for less than 30 cubic feet of air per minute per pupil. The extra amount of air when heated provides a quick heating medium. If quick heating is not provided in this way, some other method such as additional direct radiation should, for economic reasons, be provided to serve the same purpose. A quick heating system which permits the janitor to report at the building at 7 A. M. in the severest weather and have the building warm by 8:30 will save enough in fuel to pay for the quick heating facilities. The building should preferably not be allowed to cool below 50 degrees at night. All systems should permit recirculation of the air before school hours, and during school hours if perchance the temperature be less than 67 degrees. All of this can be and is usually nowadays accomplished automatically. When recirculation is thus used, all unit ventilators and all central systems should be provided with filters.

Ozonation.—Ozonation of the air has been tried, but not in a sufficient number of installations to enable authorities to form a final opinion of its value.

Ionization.—People usually declare that they don't like heated air; they say the "life" has been taken away. No doubt there is a difference due to the difference in humidity and to heating of dust particles. There is also a possibility that the electric condition of the air has been changed. Several years ago the writer was one of the first to point out that the electric condition of air affected the comfort of people. Air that has traveled across a mountain range and has given up its moisture may change from a positive electric condition to a negative electric condition, and people in the path of this air have been known to feel a marked enervating effect. They quickly become listless and tired, and the difference in temperature and humidity does not account for the trouble. These observations have led scientists to investigate the effect of ionization of the air on health conditions. It is too early to state definite results, but sufficient information has been obtained to indicate that the electric or ionized condition of the air has a marked effect on the comfort and health of the people. It is quite possible that a considerable advance will be made soon in the art of ventilation along the line of ionization, but as yet no definite standards of ionization have been set.

Classroom Vents.—Two methods of removing air from classrooms prevail. One is to vent each room by means of a vent duct leading to the attic, where the duct enters a combining chamber which in turn is vented by means of a roof ventilator to outdoors. Another is to vent each room to the corridor and then vent the corridor through one large roof ventilator above the corridor on the uppermost floor. This is known as corridor ventilation. Personally, we believe much better results are obtained with separate vent ducts than with corridor vents. There is a tendency with corridor venting for the upper corridors to be too cold, and there is always a noticeable odor in the corridors of corridor-ventilated buildings.

One of the secrets of securing a good winter-ventilation system is to avoid large vent ducts. The vent should carry away only approximately 80 per cent of the air that comes into the room. The rest should be forced out through cracks around windows, etc. By having a small vent, it is possible to keep the room under pressure, which prevents cold air from leaking in through cracks around the windows. Air leakage is normally greatest with low outside temperatures and high winds. These are the times when small vents are most beneficial.

Locker-Room Ventilation.—Fresh air should be supplied, and an exhaust fan should be used for removing the air in order to keep the locker-room under suction and prevent air from leaking out into the corridors. The leakage should be inwards into the locker-room. Venting the locker-room through the shower-room gives good results.

Toilet-Room Ventilation.—A positive exhaust fan should be used for venting toilet rooms, and all air should be drawn into the toilet room, usually from the corridors. An inch space under the toilet-room doors will avoid the use of ventilation louvres in the toilet-room doors. We strongly recommend the use of locally vented toilet equipment, so that the room can be vented through the toilet fixtures. This necessitates a small amount of toilet exhaust duct work, but the results are worth the additional cost.

Inspection.—All ventilation systems should be so constructed that all ducts, filters, etc., can be readily inspected.

Zoning.—In large schools the best results are obtained when the ventilation equipment is split up into a number of zones to permit operating the ventilation system for each zone only when required and as required for weather and occupancy conditions.

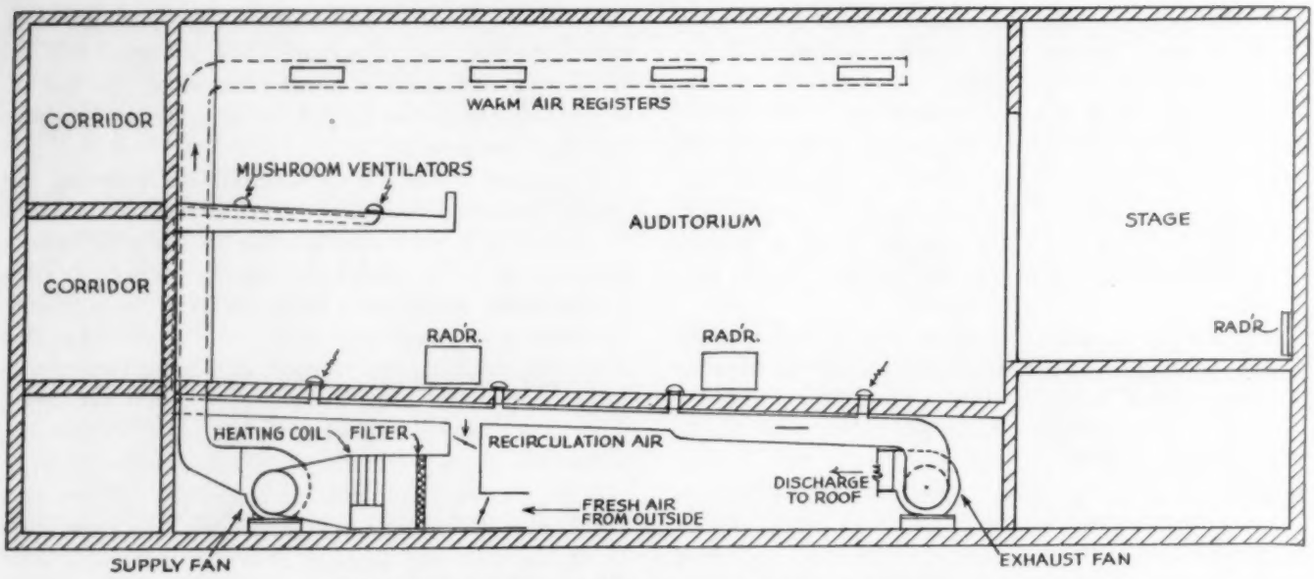


Fig. 6—Diagram of auditorium downward system of ventilation

Attic Central Fan Systems.—Lack of space prevents discussing the merits of basement and attic locations for central fans. Either method can be made to work satisfactorily.

Auditorium Ventilation.—Small auditoriums are usually ventilated the same as classrooms, but with indifferent success, largely owing to the chimney effect of the high rooms. The natural tendency for the warm ventilation air is to rise, and for the cool air from along the outside walls to drop to the floor, with resulting high ceiling temperatures and cold floors. Leakage in from cold corridors will also cause cold floors. We find it essential to install some direct radiation near the floor on outside walls to help circulate the cold air off the floor. Introducing warm air at the floor and venting it at the ceiling—that is, "upward" ventilation—has not proved satisfactory. In large auditoriums, when funds permit, we prefer to use the "downward" system of ventilation, using a central supply fan to furnish the fresh warm air 10 to 12 feet above the floor, and using an exhaust fan to vent the air through openings under the seats. (See Fig. 6.) By proper control of the fan speeds, it is possible to put the auditorium under pressure so that the air can be made to leak out from the auditorium into the corridors. This makes all seats near the doors just as desirable as seats in the middle of the room. Care should be taken to keep the air-supply grilles as high as possible, so that the air will be well distributed across the auditorium, and separate vents should be provided for the balcony. Enclosed light wells or enclosed skylights acting as "heat traps" are frequently a source of overheating in auditoriums in mild weather and should be avoided if possible.

Full Automatic Control.—Full automatic control of the time and manner in which the ventilation system is used is being adopted in some large schools. It is well known that a considerable saving in cost of fuel can be effected by close control of the time of stopping and starting ventilation units. The cost of heat for ventilation purposes is a big percentage of the annual cost, and so it is important to avoid operating the ventilating units unnecessarily and to avoid using outside air except when classes are in session. Fifteen minutes' unnecessary operation before school opens, and 15 minutes after school is closed, means one half-hour per day unnecessary operation; which is about 10 per cent unnecessary operation. All ventilation systems should be run on a schedule determined by the school principal in consultation with the custodian, following recommendations by the designing architect and engineer.

Fresh-Air Intake.—Favor the side of the building facing the prevailing wind, usually the west side. Taking air from the roof is usual, but is not so good in warm spring weather, when the roof is hot. Above all, avoid taking air from an enclosed central court; smoke under certain wind conditions will curl down into the court and get into the ventilation system.

GRINNELL COMPANY INC.

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Don't Let This Happen To You!

FIGURES of the National Board of Fire Underwriters indicate fires are occurring in School property at the average rate of five a day. That the annual loss on School and College property in the United States is estimated at over $5,000,000.00. As for the loss of life, no money value can ever measure the sorrow and suffering in any family where a member was seriously crippled or mercilessly burned to death.

Regardless of the fact that fire-resistive building materials, structural improvements, fire drills, etc., are being employed to combat it, fire is daily exacting this heavy toll. Although of modern construction, a building can be destroyed by its burning contents. The interior becomes a blazing inferno and the intense heat causes walls to topple, roofs to fall. Despite the valiant efforts of local fire fighters, often summoned too late, the building becomes a mass of ruins.

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Such a material is Toncan Iron—the alloy of refined open-hearth iron, copper and molybdenum with the greatest resistance to rust and corrosion of any ferrous material in its price class. Records of more than 30 years of trouble-free, low-cost service prove its economy.

Toncan Iron is highly resistant to rust throughout its entire structure. It is ductile and easy to work—with the savings in fabrication and installation often offsetting its additional cost. Any extra cost that remains is more than eliminated by the longer life it affords.

TONCAN IRON SHEETS — This long-lasting metal is available in black and galvanized sheets in all standard sizes and gauges. It is ideal and is being widely used for all types of interior and exterior sheet metal work—roofing, flashing, gutters, eavestroughs, downspouts, heating and ventilating ducts, hoods and ducts in laboratories, etc. It is also available fabricated into laboratory furniture.

In Circle: **Rust-resisting Toncan Iron skylights on one of the buildings of the University of Minnesota**
Below: **Old Dartmouth Hall, Dartmouth College, with sheet metal parts of Toncan Iron**

TONCAN IRON PIPE — Many schools take no chances with their piping system—they have installed Toncan Iron Pipe. It is available black or galvanized and in standard or extra heavy weight. It is recommended for air, gas, hot and cold water, steam mains and returns, and drainage and vent lines. For ordinary piping service, Republic also makes high quality steel and copper-bearing steel pipe. Write for a copy of "Pipe for Permanence." It presents many interesting facts about pipe life and cost.

Toncan Iron Pipe was used for all underground plumbing lines in the Champaign Junior High School, Champaign, Illinois. Republic Steel Pipe was used for lines above ground

In the Silver Springs, Md., High School all steam return lines are rust-resisting Toncan Iron Pipe. Main and riser lines are Republic Copper-Bearing Steel Pipe

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RIC-WIL

PRODUCTS

Ric-wiL Interlocking Conduit and Base Drain Foundation, Tile and Cast Iron; Ric-wiL Unit Steam Main; "Dry-paC" Waterproof Asbestos Conduit Insulation.

Ric-wiL Interlocking Conduit

Ric-wiL Conduit is first quality, standard weight, vitrified glazed tile of the bell and spigot type.

It is shipped on the job in full round sections and split into top and bottom halves as used. Thickness of tile is reinforced to double strength at top and bottom. When installed, bell and special Loc-liP side joints are sealed with portland cement. Loc-liP joint (see illustrations) is shaped so that cement locks top and bottom halves permanently together in all directions, giving conduit extraordinary rigidity and strength. Leakage is practically impossible. Top and bottom halves are interchangeable (foolproof) and numbered in pairs so that companion pieces may be kept together.

Sections are all in 2-ft. lengths, sizes from 4 to 27-in. inside diameter. Every sixth section of conduit has an opening in the bottom half through which a pipe support of the roller type projects to carry the steam, hot water or oil pipes, thus making the pipe supports independent of the conduit itself, a desirable feature for this class of work.

Ric-wiL Interlocking Base Drain Foundation

Ric-wiL Base Drain Foundation is first quality vitrified glazed tile, so designed that it is both a base for supporting and lining up the conduit and drain for carrying away water which might otherwise accumulate around the conduit. Top of base drain has slot into which the bell of conduit fits, making sections of conduit and base drain stagger with each other to form a strong interlocking construction. Pipe support saddles rest on the side shoulders, which insure perfect alignment of pipes. Wide flat bottom of base drain makes a solid foundation. Free drainage area of the base drain is large and ample for every practical condition. Made in three sizes to support properly all conduit sizes.

Cast Iron Ric-wiL Conduit

For extra heavy duty under railroads or where conduit is subject to very heavy loads, Ric-wiL is made of cast iron. Has Loc-liP Joint and "interlox" with tile Ric-wiL—made for all 5 types described in next column. A special heavy duty tile base drain or a cast iron base drain is provided for use with Ric-wiL Cast Iron Conduit.

Three Selected Ric-wiL Types

PRODUCTS

Roller Pipe Supports; Alignment Guides; Manhole Covers; Asphalt Impregnated Filter Tape.

Five Systems to Meet All Conditions

Type F System—For steam heating, power pipes and superheated steam. A conduit that assures super-efficiency when insulated with Dry-paC (description below), or Ric-wiL No. 11 Filler, packed around pipes in closed construction.

Type SPC System—For steam heating, power pipes and superheated steam. Insulation is any standard make of sectional pipe covering, kind and thickness depending upon service to be rendered. Double drainage is provided in this type.

Type DA System—For hot water, oil transmission and condensation returns. Tile and insulation in one, the latter, a diatomaceous earth mixture of high insulating quality, moulded inside the tile and keyed in. This type insulates the pipes from surrounding ground but not from each other, making it specially adapted to carry oil and steam pipes together for oil transmission. Exceptionally easy to install.

Type DF System—For steam heating, power pipes and superheated steam. This is Type DA with the addition of Ric-wiL Asbestos Conduit Filler to be packed around pipes at a density specified by manufacturer. Filter is a good non-conductor which will not corrode the pipes nor shrink. Dry-paC furnished when specified.

Super-Strength Tile Conduit—To support any average traffic load, is also available. Details on request.

Dry-paC Waterproof Conduit Insulation

A high-grade long fibre asbestos insulation, processed so that it is permanently water repellant. Of unusually high efficiency and great natural strength, it will not slump down away from pipes and is non-corrosive. Sample will be sent gladly for testing.

Ric-wiL Pipe Supports

Standard pipe supports will carry from one to five or more pipes and are ordinarily spaced 12 ft. apart. They are strong, made of cast iron, rustproofed, and interlocked with the base drain foundation, imposing no load on the conduit itself.

Engineering Service

Full co-operation with architects and engineers; complete service details and installation instructions; installation supervision where desired.

Catalogues, test reports, typical specifications, etc., promptly on request.

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STREAMLINE PIPE AND FITTINGS DIVISION

MUELLER BRASS CO.

Port Huron, Michigan

PROTECT THE INVESTMENT FOR THE LIFE OF THE BUILDING WITH ENDURING COPPER AND BRONZE

STREAMLINE bronze solder fittings and copper pipe are a radical departure in conducting systems for plumbing, heating or industrial use. Their unique method of connection has made it possible to use copper piping of hard temper and of a sufficient wall thickness to meet all requirements of actual service. This is in direct contrast to threaded copper pipe, which had to carry a very heavy wall to insure a sufficient thickness to meet service conditions after this thickness had been cut away approximately 50% in the fabrication of the thread. Threaded copper pipe for this reason is naturally very expensive and gives no extra service for its additional wall thickness on the unthreaded portion.

Streamline Solder Fittings are manufactured under U. S. Patents 1,770,852; 1,776,502; and 1,890,998

Illustrated Mechanical Features of the Streamline Fitting

STREAMLINE solder fittings and copper pipe are installed at a price very slightly in advance of rustable materials.

STREAMLINE fittings and copper pipe are ideal for use in all types of educational buildings for all general plumbing and heating purposes: for steam supply, condensate return, cold water, drinking water supply and return, and hot water supply and return piping. Among the many advantages are:

No rusting or clogging—No discoloration of water from scale or rust, nor any decrease in volume or pressure such as is invariably found after a few years with corrodible materials.

Light Weight, yet great strength—The STREAMLINE solder fitting, less heavy and consequently less expensive for any given size, produces a connection that is enormously strong and leakproof.

Minimum space required—Although STREAMLINE solder fittings produce enormously strong joints, they are very little larger than the pipe lines which they connect. They do not protrude like screw type fittings. Since these fittings are not screwed into place when connected to the pipe and no space is required for wrench handling, etc., they can be installed very close to each other, thus saving considerable space.

Leaks due to vibration eliminated—Constant vibration has no effect on a joint made with STREAMLINE solder fittings. Its effects are not localized as is the case with screw type fittings, but are harmlessly dissipated throughout the system.

Visual proof an exclusive feature of the Streamline Fitting.—When the mechanic installs STREAMLINE he can tell at a glance that the joint he has made is permanently leakproof without an actual pressure test. This is a valuable asset especially in concealed work.

The STREAMLINE solder fitting is not connected by threading or flaring but by soldering, utilizing one of nature's laws—capillary attraction—to form a permanently tight joint of great strength. The joint, in contrast to threaded connections, is actually reinforced and is the strongest point in the line, instead of the weakest.

Cut-away Sectional View of STREAMLINE Tee. Note How Pipe Is Recessed Into the Fitting, Resulting in a Uniform Smooth Waterway

The illustration herewith shows the mechanical features of the STREAMLINE solder fitting. After the joint has been fluxed and assembled in the pipe, it is heated and solder introduced through the feed hole. Capillarity immediately distributes it thoroughly and evenly between the bonding surfaces, producing a joint so strong that in a pulling test, the pipe will actually break while the joint remains without the slightest damage. It requires over 9000 pounds of pull even before the fracture in the pipe occurs. This, of course, is away beyond anything required of it in actual service.

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STREAMLINE hard copper pipe and fittings are particularly recommended for all heating plants—whether by hot water or steam—a special virtue of copper pipe being its capacity to hold heat with a minimum of radiation, yet to conduct it very rapidly, so that there is a minimum loss of heat when being conveyed from the point of generation to the points of distribution. Since copper cannot rust, the original delivering capacity of STREAMLINE pipe remains the same indefinitely. In all heating plants, we claim greatly increased benefits in all installations made with STREAMLINE, with noteworthy savings in both fuel and material.

STREAMLINE pipe and fittings are installed in over four hundred schools and colleges throughout the United States and, in fact, in every type of building construction. They have been specified by leading architects everywhere.

STREAMLINE fittings are furnished in complete range from ¼" to 10".

The word STREAMLINE is the Registered Trade Mark of the Mueller Brass Co., Port Huron, Michigan

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AMERICAN DISTRICT STEAM COMPANY

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Manufacturers of District Steam Heating Equipment and ADSCO Water Heaters

North Tonawanda, N. Y.

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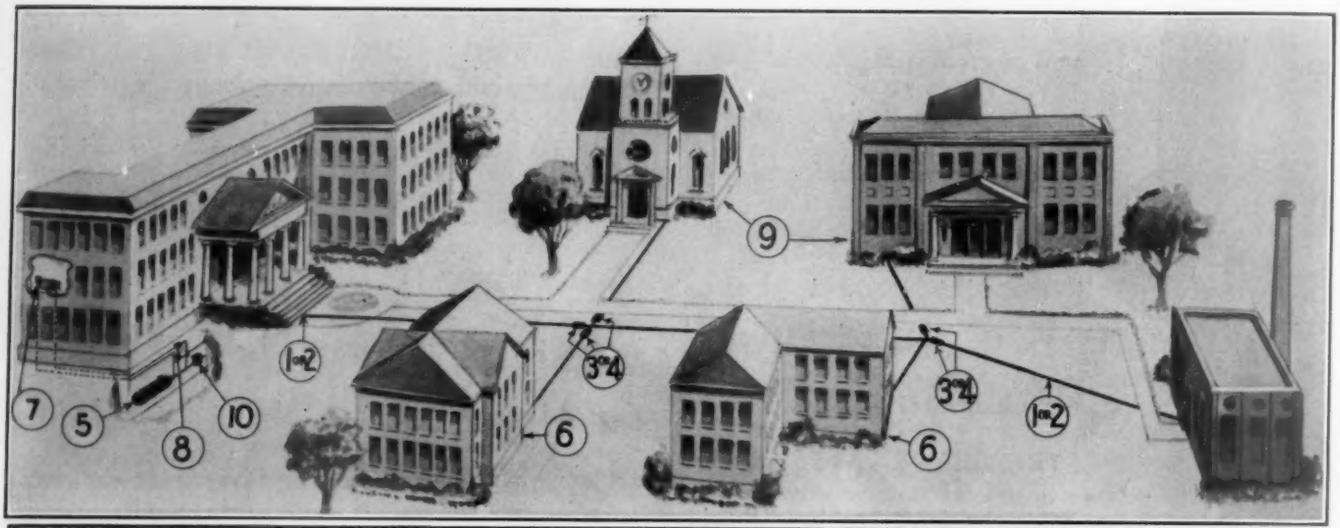

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② ADSCO-BANNON TILE CONDUIT	④ ADSCO PACKLESS EXPANSION JOINT	⑥ INSTANTANEOUS WATER HEATER	⑧ VERTICAL STEAM TRAP	⑩ ROTARY CONDENSATION METER

FOR HEATING SYSTEM DEPENDABILITY AND ECONOMY, SUPERINTENDENTS OF BUILDINGS IN FOREMOST COLLEGES USE ADSCO STEAM LINE PRODUCTS

WHEN new college buildings are to be heated from a single boiler plant or when reconstructing existing underground steam lines, the Superintendents of Buildings and Grounds in many of the foremost American colleges insist upon ADSCO steam line equipment because they know from experience that it is dependable in operation and economical in cost.

There is a proven ADSCO product for a complete district steam heating system from a single boiler plant to all college buildings including underground conduit, expansion joints, meters, steam traps, reducing valves, water heaters, etc. The typical campus layout above illustrates the use of the major ADSCO products.

School Executives, Superintendents of Buildings, and School Architects and Engineers are invited to submit their campus heating problems to ADSCO engineers for recommendations which will be based on over 60 years' practical experience in steam distribution by the originators of district steam heating.

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N. J. State Teachers College
Pa. State Teachers College
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St. Bonaventure College
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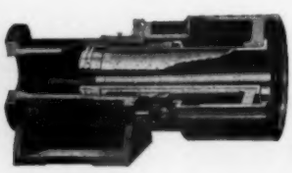
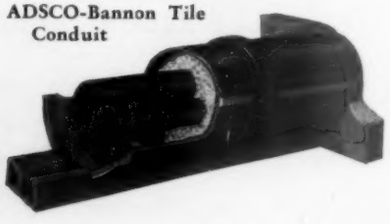


ADSCO-Bannon Tile Conduit



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South Norwalk, Conn., U. S. A.

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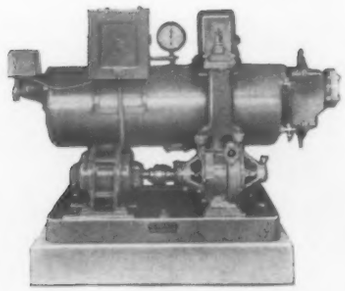
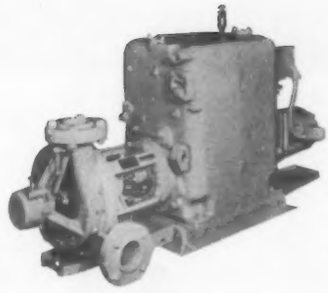


JENNINGS RETURN LINE VACUUM HEATING PUMPS

Standard with the heating industry for over sixteen years. They remove air and condensation from the return lines of vacuum steam heating systems, discharging the air to atmosphere and returning the water to the boiler.

Two independent units are combined in a single casing—an air unit and a water unit. Impellers of both are mounted on the same shaft. The pump is bronze fitted throughout.

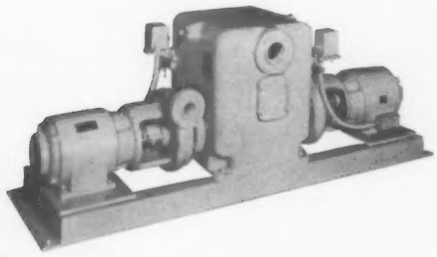
Supplied either direct connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous or automatic operation against pressures up to 40 lbs. Supplied standard in capacities up to 300,000 sq. ft. E.D.R.



JENNINGS VAPOR TURBINE VACUUM HEATING PUMPS

The Jennings Vapor Turbine Heating Pump combines all of the advantages of the standard return line heating pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains on any system, requiring a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the safety and economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current. Furnished standard in capacities up to 150,000 sq. ft. E.D.R. Information on request.

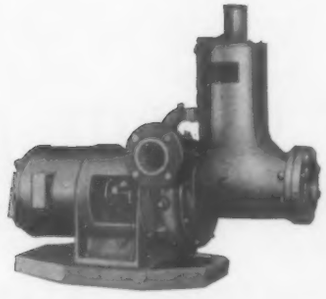


CONDENSATION PUMP AND RECEIVER

Removes condensation from radiators in return line steam heating systems and pumps condensation back to the boiler.

They are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Bronze fitted throughout, with Tobin bronze shaft. Impeller is of special design adapted to handling hot water with highest efficiency.

Jennings Condensation Pumps are furnished in standard sizes with capacities ranging from 1½ to 225 g.p.m. of water, for serving from 1,000 to 150,000 sq. ft. equivalent direct radiation.



JENNINGS SUMP AND SEWAGE PUMPS AND SEWAGE EJECTORS

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sump Pump is fitted with a non-clog type impeller. Pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.

There are two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing.

Capacities and heads to meet all requirements.

JOHN J. NESBITT, INC.

Manufacturers of

Heating, Ventilating and Air Conditioning Equipment

Holmesburg, Philadelphia, Pa.

11 Park Place, New York City

THE NESBITT SYNCRETIZER

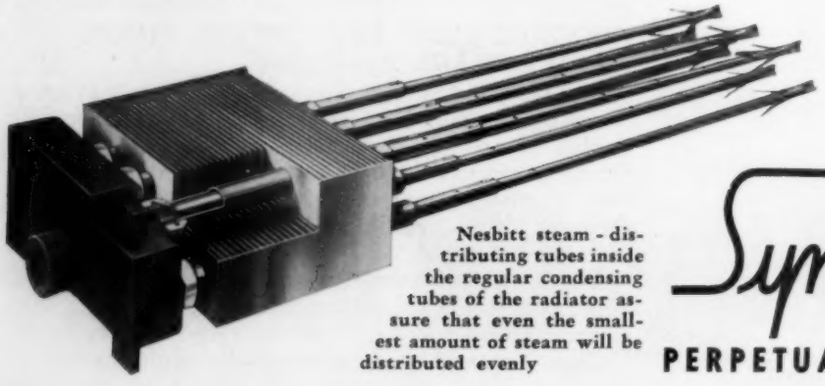
has completely revolutionized standards of schoolroom heating and ventilating. Fully automatic, and doubly controlled by a room thermostat and an air-stream thermostat, this advanced heating and ventilating unit harmonizes, or **syncretizes** room and air-stream temperatures, thus producing **Syncretized Air** . . . constant spring weather indoors.

Fresh Air Without Drafts or Overheating

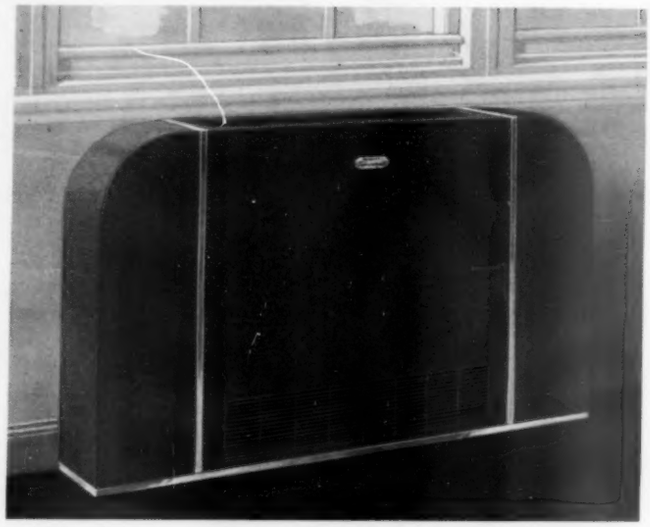
Nesbitt Syncretizers are adjustable, according to any state's requirements, to deliver all or part outdoor air, but **always some outdoor air,** to occupied classrooms. Nesbitt's insistence that outdoor air ventilation is regularly needed to maintain comfort and health and to abate odors has the weighty backing of nearly all state laws, of the American Society of Heating and Ventilating Engineers, and of the latest researches. The Air-Stream Minimum Temperature Control provides that all air taken from outdoors is first warmed to a safe minimum temperature, thus preventing drafts. The Room Temperature Control assures that the desired room temperature will be uniformly maintained, without permitting overheating.

New Type Radiator

In the development of the Syncretizer an entirely new type of heating radiator was evolved . . . one that possesses a high heating capacity, yet is susceptible to the slightest demands of its two controls,—either the room thermostat or the air-stream thermostat. Its success lies in the use of dual steam-distributing tubes within the regular radiator tubes—a Nesbitt innovation. Whether the radiator is supplying its full heat capacity, or merely tempering the incoming air, there is assured the **equally** warmed air discharge which contributes largely to Syncretizer success and economy.



Nesbitt steam - distributing tubes inside the regular condensing tubes of the radiator assure that even the smallest amount of steam will be distributed evenly



The Ideal Heating and Ventilating Unit for TODAY and TOMORROW—The Nesbitt Syncretizer

Beautiful–Quiet–Economical

The Nesbitt Syncretizer is uniquely modern in appearance, yet its beauty is entirely conformable to schoolroom design. Tests have proved it to be the quietest of units. But the point which wins it great favor with school boards is its surpassing economy of fuel.

Widespread Acceptance

Today, in over 63,000 schoolrooms of the United States and Canada, more than two million girls and boys enjoy the health and comfort of vital air, properly filtered, tempered and distributed according to the best scientific knowledge, by heating and ventilating units manufactured by John J. Nesbitt, Inc., or its subsidiary, the Buckeye Blower Company.

Nesbitt Syncretizers are sold by American Blower Corporation, Buckeye Blower Company, and John J. Nesbitt, Inc. Complete information is contained in Publication No. 226, "The Story of Syncretized Air." Complete engineering data is contained in Publication No. 225. Both publications are free on request. Address John J. Nesbitt, Inc., Holmesburg, Philadelphia, Pa., or 11 Park Place, New York City.

NESBITT *Syncretized Air*

PERPETUAL JUNE IN THE CLASSROOM

WARREN WEBSTER & COMPANY

Camden, N. J.

Pioneers of the Vacuum System of Steam Heating
Branches in 60 Principal U. S. Cities—Established 1888

CENTRAL HEAT CONTROL FOR 22 COLLEGE BUILDINGS

Webster Moderator System at Mount Holyoke First Large Installation of Its Kind; Control-by-the-Weather

In 1934, Mount Holyoke College, South Hadley, Mass., completed an extensive modernization of steam using facilities, including a Webster Moderator System for central heat control of 22 existing buildings of various age and equipment, many one-pipe, some two-pipe and two hot water installations.

"Control-by-the-Weather" is provided by automatic Outdoor Thermostats, supplemented by a central control (shown at right below) including (a) lights to indicate functioning of control valves and accumulation of water in key radiators, (b) switches for remote shut-off, (c) Variators to increase or decrease steam delivery to any zone. This central control eliminates "cruising" of the campus by the operating force and permits observance of a definite operating schedule for each building.

A test demonstrated that the control system provides adequate facilities for effecting a 25 per cent reduction in heating expense. Further experience during 1935-36 has proved the value of the Webster Moderator System in effecting minimum steam consumption with minimum operating force and adequate heating.

While Webster Moderator Control has been employed for smaller groups of buildings, this is the first large installation of its kind. It has been inspected and commented on by many leading engineers and operators. Results warrant the prediction that coordinated central control of the heating of large institutional groups will rapidly supplant past methods of uncoordinated control of separate buildings.

The control contract was executed by Warren Webster & Company, under the direction of Clyde W. Colby and the Office of Hollis French, associated consulting engineers for the college authorities. Fred T. Ley & Co., was the general contractor. Steam fitting was done by Holyoke Valve and Hydrant Company, prominent Massachusetts heating contractors.

The installation was described recently in HEATING AND VENTILATING, leading technical publication, in an article entitled "Economy of Unique Control System Demonstrated at Mt. Holyoke College Plant." Reprints of this informative article will be furnished gladly to anyone interested in further details.

Central Heating Control at Mount Holyoke College

Send for a Copy of the 1938 Webster Calendar

THE POWERS REGULATOR COMPANY

45 Years of Temperature and Humidity Control

Chicago
2724 Greenview Avenue

OFFICES IN 45 CITIES
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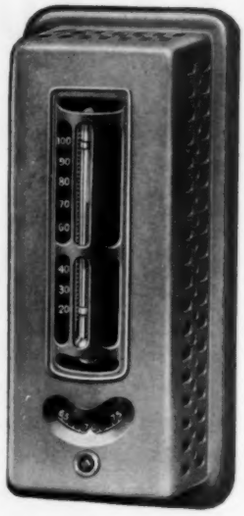
New York City
231 E. 46th Street

AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL

For Heating, Ventilating, and Air Conditioning Systems

At Harvard, Yale, Princeton, Vassar, Wellesley and hundreds of other prominent educational institutions will be found buildings equipped with the Powers Pneumatic System of Automatic Temperature and Humidity Control.



Over 45 years of experience in developing and installing automatic control for heating, ventilating and air conditioning equipment in all types of old and new buildings qualify us to assist school executives, architects, and engineers on any problem of temperature and humidity regulation.

Powers pneumatic systems often cost more than other types but they are worth more because: they often give 15 to 20 years of accurate and dependable control without repair expense.

Powers thermostats do not get out of adjustment permitting UNDER-heating and OVER-heating which not only wastes fuel but causes discomfort. Neither the extreme heat of Summer, sub-zero temperatures of Winter, nor the vibrations in some buildings, change their adjustment. They need no annual overhauling or adjustment, and the true gradual action of their powerful vapor disc controls valves or dampers gradually—resulting in exceedingly accurate regulation.

Write for Estimate. Let one of our engineers study your requirements and submit an estimate of the cost of installing the type of control best suited to your needs.

Self-operated Controls. We also manufacture a very complete line of self-operating temperature regulators that do not require electricity or compressed air for their operation. **Write for bulletins,** if interested.

Some of the many Schools, Colleges, and Universities using Powers Automatic Temperature Control

California Institute of Technology, University of Chicago, Creighton University, Dartmouth College, Georgetown University, Harvard University, University of Illinois, Lehigh University, Louisiana State University, Massachusetts Institute of Technology, University of Michigan, University of Missouri, Purdue University, Smith College, Vassar College, University of Washington, Wellesley College, Yale University

Los Angeles, Cal.	20 Schools	Kansas City, Mo.	40 Schools
Washington, D. C.	21 Schools	St. Joseph, Mo.	12 Schools
Chicago, Ill.	21 Schools	St. Louis, Mo.	10 Schools
Indianapolis, Ind.	24 Schools	Montclair, N. J.	14 Schools
Sioux City, Iowa	11 Schools	Newark, N. J.	12 Schools
Wichita, Kan.	12 Schools	New York City, N. Y.	17 Schools
Boston, Mass.	11 Schools	Yonkers, N. Y.	19 Schools
Brookline, Mass.	11 Schools	Cincinnati, Ohio	13 Schools
Fall River, Mass.	11 Schools	Cleveland, Ohio	21 Schools
New Bedford, Mass.	14 Schools	Oklahoma City, Okla.	19 Schools
Worcester, Mass.	19 Schools	Philadelphia, Pa.	23 Schools
Detroit, Mich.	24 Schools	Seattle, Wash.	14 Schools

SAFETY WATER MIXING VALVES

Safety Shower Mixers

A complete line of both pressure equalizing valve and thermostatic shower mixers that protect bathers from scalding temperatures caused by pressure and temperature fluctuations in pipe lines, and prevent sudden "shots" of hot or cold water. Maximum temperature of delivery can be limited.

For Individual Showers

Thermostatic Water Controller

For group or gang showers, zone or progressive showers. Will mix hot and cold in quantities up to 100 gallons per minute and deliver at any temperature desired. Delivery temperature is not affected by temperature or pressure changes in the supply lines.

For Group, Gang or Progressive Showers

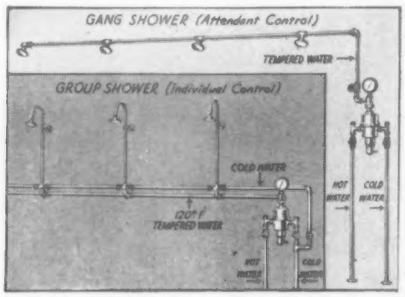
Group or Gang Shower Control—Powers Thermostatic Water Controllers are used for the control of shower baths in groups varying in size from 4 to 20 stalls. They may be used to establish a maximum temperature of hot water supply to protect the entire group from danger of scalding, or to place the entire group of showers under the control of an attendant.

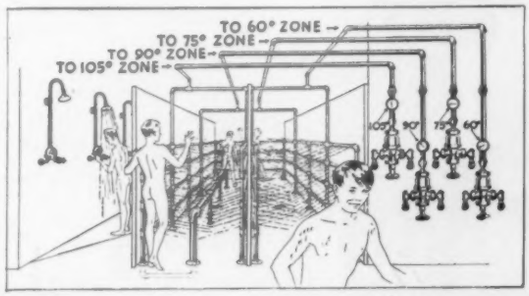
Individual Shower Control is best suited for adults as it permits each bather to individually adjust the temperature of his shower while the hot water is kept at a safe maximum temperature.

Attendant Control is best suited for the bathing of children in schools, institutions, etc., as the temperature of the entire group of showers is adjusted by one individual.

Zone or Progressive Showers—Where compulsory bathing is required before entering swimming pools, lane showers are divided into four zones, each controlled by a Powers Controller. First zone is maintained at 105° F.; second at 90° F.; third at 75° F.; and fourth at 60° F. Because of its efficiency and its hygienic and sanitary advantage, this type of shower is rapidly increasing in popularity.

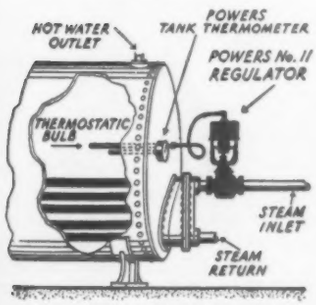
Write today for new 24-page Bulletin No. 258 which shows photographs of a variety of modern shower installations. It gives helpful advice in laying out shower rooms and completely describes Powers Safety Water Mixing Valves.





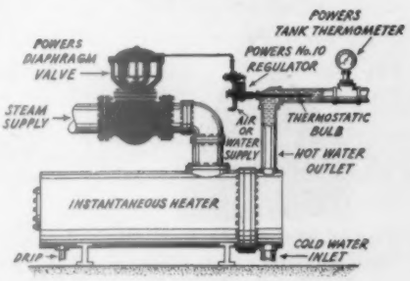
TEMPERATURE CONTROL FOR STEAM HEATED HOT WATER HEATERS

Self-operated



The most complete line of money saving regulators for this purpose. Often pay for themselves during the first year and give dependable control for 15 to 20 years. All steam valve sizes up to 10 inches. **Write for Bulletin No. 2035.**

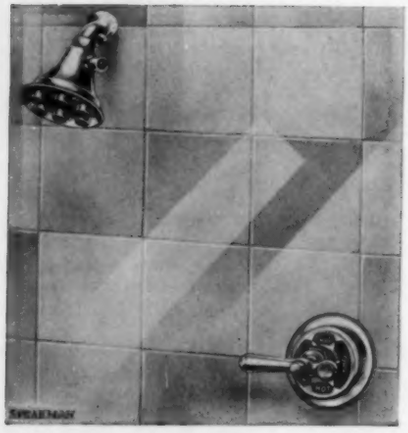
Compressed Air or Water Pressure Operated



SPEAKMAN COMPANY

Wilmington, Delaware, U. S. A.

SHOWERS AND SHOWER HEADS



K-3100

K-3100—SPEAKMAN Built-in Mixometer Shower. Size ½ inch. Mixometer with metal wall plate and metal lever handle. Anystream Self-Cleaning Head with lock-shield control. Short, 30° angle flanged shower arm drilled for expansion or through bolts

K-3105—Same as K-3100 but with Hi-Seat Valves with unions. Renewable seats, metal escutcheons and metal handles

K-3315—SPEAKMAN Columbia Shower. Size ½ inch. Compression valves with cast wall lugs and metal handles. Supplies to overhead 36 inches long. Horizontal discharge arms setting head 15 inches off center. Anystream Self-Cleaning Head with lock-shield control set at 30° angle

K-3310—Same as K-3315 but with Mixometer with cast wall lugs and metal lever handle

K-3315

Normal Spray

Needle Spray

Flood Spray

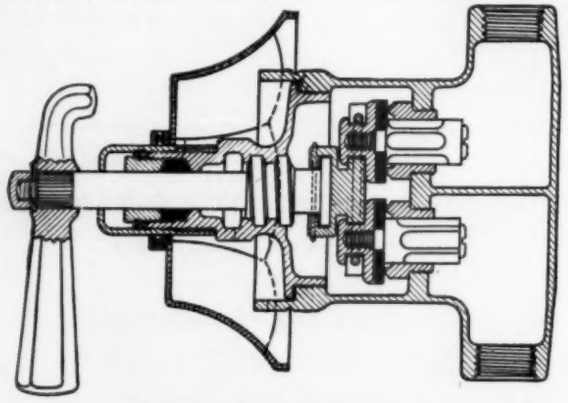
K-3395—SPEAKMAN (Patented) Anystream Self-cleaning Shower Head with lever handle control. ½-inch size. Ball joint not furnished unless specified

K-3399—SPEAKMAN Wall Type Anystream Self-cleaning Shower Head

Speakman Company makes a complete line of showers, shower heads and plumbing fixtures designed for use in schools, colleges, universities and institutions. In designing this equipment particular attention has been given to water economy, as well as cost upkeep. Speakman Showers and Fixtures are sturdy in construction and easy to operate, and all parts subject to wear are renewable.

The Anystream Self-Cleaning and Adjusta-Spray Shower Heads eliminate the annoyance caused by stopped-up shower heads. Both have self-cleaning features with variable spray adjustment. Instead of holes in the face of Anystream Self-Cleaning Head, plungers with tapered grooves give full, round, unbroken sprays. By turning the handle the bather may select a normal, needle, or flood shower spray. The flood spray flushes out any dirt or sediment.

On installations where funds available will not permit the use of the Anystream Self-Cleaning Head, we recommend the Adjusta-Spray Head. Grooved slots in the face discharge water at three different angles, insuring a well distributed spray—not a hollow-centered, cone-shaped spray.



The Speakman Mixometer

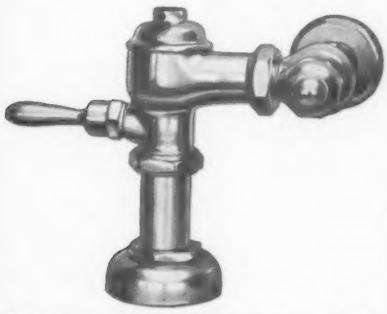
The name "Mixometer" means to mix and measure. The Mixometer mixes hot and cold water to a mechanical exactness and measures the volume so that an equal amount of water passes through the shower at all temperatures. With the Mixometer, cold water follows the first fractional turn of the handle, then warm, and finally hot, if desired; but it is impossible to get hot water first.

K-3396—SPEAKMAN Anystream Self-cleaning Shower Head with ½-inch I. P. female inlet and lock-shield arranged to operate by a key

K-3397—Same as K-3396 but with screwdriver control

K-7047—SPEAKMAN (Patented) Adjusta-Spray Shower Head with integral ball joint having ½-inch I. P. inlet

K-7052—SPEAKMAN Wall Type Adjusta-Spray Shower Head. ½-inch I. P. size back inlet



K-9000 — SPEAKMAN Si-Flo Closet Flush Valve. Has 1-inch capped angle stop for right or left inlet, wall flange, metal oscillating handle, flush connection, spud coupling nut and flange for 1½-inch top supply (Patented)

K-9082 — SPEAKMAN Si-Flo Urinal Flush Valve for stalls. Has ½-inch capped angle stop for right or left inlet, wall flange, metal oscillating handle, flush connection, spud coupling nut and flange for ¾-inch top supply

Speakman Si-Flo Flush Valve

The Si-Flo Flush Valve eliminates all noises heretofore associated with flush valves, because these noises are prevented from forming. The Si-Flo Flush Valve is quiet in operation, is efficient, and works equally as well under high or low water pressure. This flush valve roughs in on standard measurements and can be used for new installations or to replace noisy flush valves. It can be furnished with right, left or back supply; built in the wall or seat-action type. The Si-Flo Flush Valve can also be supplied for urinals and metering showers.

The Compact Piston Unit

The Si-Flow Flush Valve has no metal to metal wearing parts. The piston is made of a hydraulically moulded composition noted for its long wearing qualities and resistance to solvents, alkalis, and acids. The gaskets are made of the best grade moulded rubber composition, and are positively non-curling. The cup leather is hydraulically formed and treated so that it will retain its shape and pliability indefinitely.

This unit can be replaced in five minutes at nominal cost.

Anti-Syphon Devices

Anti-Syphon stop will be supplied without extra charge when sanitary code requires it. Where Anti-Syphon stop is angle pattern, state whether it is to rough-in right or left. Where Anti-Syphon Stop will not meet code, a Back Syphon Preventer can be furnished at slight extra cost.

Piston Unit

The Si-Flo Flush Valve piston unit, noted for its long-wearing qualities, contains no metal to metal wearing parts. It can be replaced in five minutes at a nominal cost

K-9056 — Si-Flo Seat Action Closet Flush Valve with 1-inch straight stop, flush connection for 1½-inch top supply, adjustable bar check-hinge, black hard rubber open-front seatless cover

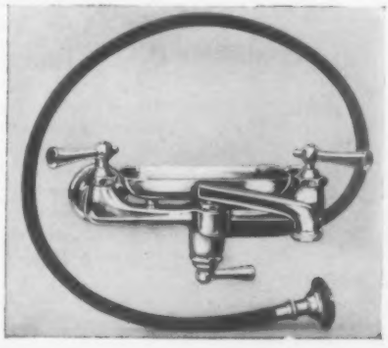
Sink, Bath and Lavatory Fixtures

SPEAKMAN sink, bath and lavatory fixtures are designed to give the maximum of service. Every fixture is accurately machined and thoroughly tested under high water pressure. All valve parts subject to wear, including seats, are renewable. A swivel disc encasing the washer distributes wear on washer and seat. Monel metal washer-retaining screws are used because of their resistance to the corrosive action of certain types of water.

Catalogs K-1 and K-2

Send for our Catalogs K-1 and K-2. They contain full information, including blueprint drawings and technical data on various types of Speakman Showers and Fixtures and the Si-Flo Flush Valve especially adapted for use in schools, colleges and institutions.

K-7120-M SPEAKMAN Pop-up Lavatory Waste. Metal knob and metal escutcheon. 1¼-inch diameter tail



K-5504-M SPEAKMAN Grace-Line Sink Fixture. (Design patented.) With transfer valve, hose and spray head. ½-inch I. P. male connections. Center of inlets 8 inches. Adjustable threaded flanges, extra large and removable soap dish. Non-splash nozzle

K-6790 SPEAKMAN Self-Closing Basin Faucet. Non-removable metal indexed push button. Non-hammering. Closes by both water and spring pressure. Nozzle 3¾ inches long with non-swirl stream regulator. Renewable working parts. ¼-inch threaded tail

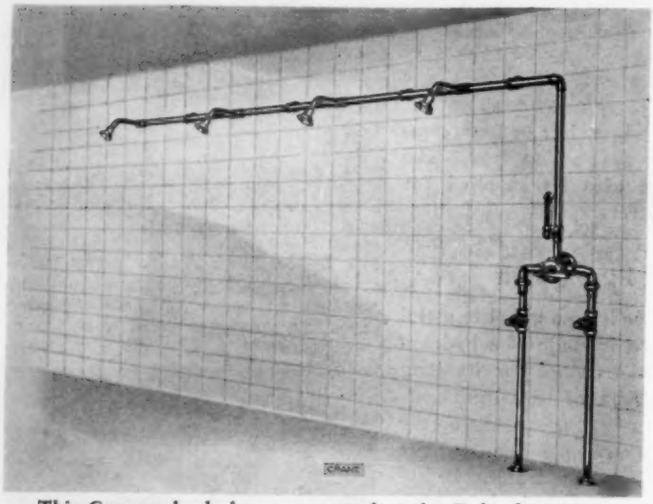
K-5503-M SPEAKMAN Grace-Line Sink Fixture. Same as K-5504-M but less transfer valve, hose and spray head

CRANE CO.

Valves, Fittings, Pipe, Plumbing, Heating, Pumps

General Offices: 836 South Michigan Avenue, Chicago, Ill.

NATION-WIDE SERVICE THROUGH 134 BRANCHES AND MORE THAN 500 WHOLESALERS



This Crane school shower system has the *Refreshor* easy-to-clean shower heads. Supply valve is mixing type.

Scientifically designed for school use, only 13″ from floor to rim, this Crane *Lowall* closet has the concealed *Delta* seat-operated flushing valve and ebony finish hard rubber open front and back seat.

The *Erie* double-jet wall type drinking fountain is of new design in beauty and utility. Made of vitreous china. Has push-button ice water faucet. Sturdily built throughout for school service. Fitted with automatic stream regulator, and self-closing valves to prevent waste of water.

The Crane *Improved Triumph* ball-bearing, self-closing faucet is designed for rugged service and long life. Raised spout prevents back siphonage. Reduces water bills to the minimum.

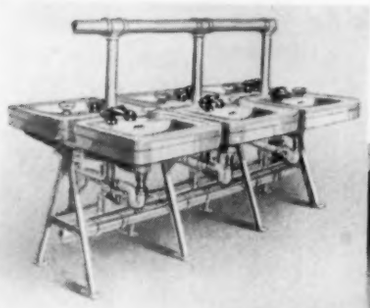
The Crane *Delta* flushing valve for closets and urinals has the *Vigilant* Vacuum Breaker which prevents contamination of water supply lines.

The added burden placed on sanitary equipment, as a result of increased enrollments, reveals the utter inadequacy of plumbing that is not modern, and the need for increased sanitary facilities. When planning modernization or new construction, consider these vital requirements of school plumbing:

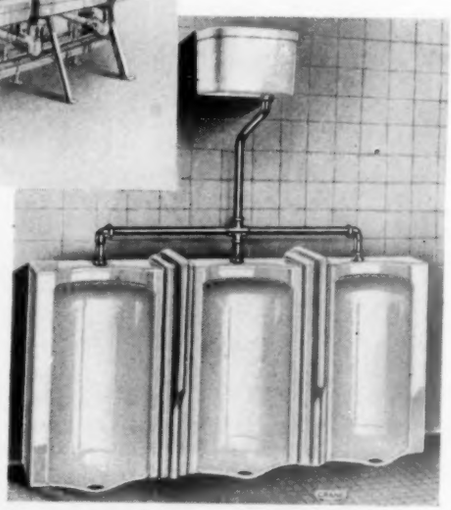
(1) **Maximum protection against contamination and the spread of water-borne diseases.**
(2) **Durable construction to withstand the severity of school service—to assure lasting economical service.**

Look to Crane for plumbing equipment that meets the most exacting requirements of school service. The Crane line is complete—in type of equipment as well as variety of design—for every kind of installation. Specify Crane-Equipment throughout and enjoy the advantage of a single source of responsibility.

Let Crane engineers help you determine what must be done to bring your school up to the standards of modern sanitation. Write for your free copy of "The Importance of Sanitary Equipment in Schools."



Crane *Norwich* lavatories in battery assembly are of vitreous china with durable cast iron frame. Basins are rectangular with splash lips. Fitted with *Improved Agilis* double faucets, the famous Lever Action *Securo* quick draining waste control, and china soap dish.



Crane vitreous china stall urinals are ideal for the modern school. Integral flushing rims provide proper overall cleansing. Fitted with separate extended intermediate shields. Up to five urinals can be flushed with one tank with automatic flushing valve.

THE HALSEY W. TAYLOR CO.

Main Office and Factory: 137 North Street, N. W., Warren, Ohio

OFFICES IN THE FOLLOWING CITIES

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Pittsburgh, Pa.	Baltimore, Md.	Memphis, Tenn.	Minneapolis, Minn.	Des Moines, Iowa
	New Orleans, La.	Nashville, Tenn.	Kansas City, Mo.	

PRODUCTS

Halsey Taylor Sanitary Drinking Fountains and also Electric as well as Ice Coolers. Patented Automatic Stream Control, Two-Stream Projector, Non-Squirting Features.

DRINKING WATER SERVICE

Halsey Taylor Drinking Fountains are made and sold by the largest organization devoted exclusively to that line of manufacture. Our sole aim and purpose is to produce the best fountain for any need, and our entire resources and facilities are pointed toward that end. We aim to sell a service rather than a mere fountain and invite architects or builders to write us relative to any problems that may arise in connection with drinking-water provision.

These fountains embody distinctive features, resulting in the following advantages:

FEATURES

(1) Practical Automatic Stream Control—An automatic device maintains a constant height in the drinking stream, even though the line pressure may vary 50 pounds. The stream is never too high, never too low.

(2) Ideal Drinking Mound—The 2-stream projector was designed for and adopted by the Government during the war. This exclusive design makes the side stream really practical, and removes the objections found with ordinary sidestream foundations because of their hoselike stream.

(3) Absolute Sanitation—The drinking mound is formed by the converging of two streams of water, thus setting up an interference forming a localized drinking mound which makes it impractical to drink from any other point, therefore sanitary in the extreme. The finger or lips cannot come in contact with or contaminate the source of supply. It is absolutely impossible to squirt the water.

FOR ANY FEED

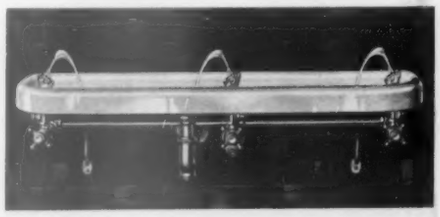
You will find fountains in the Halsey Taylor line to meet any requirements.

Halsey Taylor exclusive features are now available in cabinets for use with various types of electric refrigeration units.

Write for special literature.

NO. 2616

Illustrations show a few of vitreous china fixtures with patented Halsey Taylor features



NO. 2703

NO. 2601

NO. 2605

NO. 2609

CHOICE OF COLOR

All vitreous china fixtures shown in this catalog can be furnished in various colors to match the woodwork, marble, or interior trim.

MARBLE FOUNTAINS

Send for roughing-in measurements of Halsey Taylor fittings for marble, or terra cotta wall and pedestal fountains.

BLUE PRINTS

Blue prints giving details will be furnished for any fixtures shown.

The complete Halsey Taylor line of pedestal, wall and battery types is illustrated and described in our latest Catalog. Send for your copy.

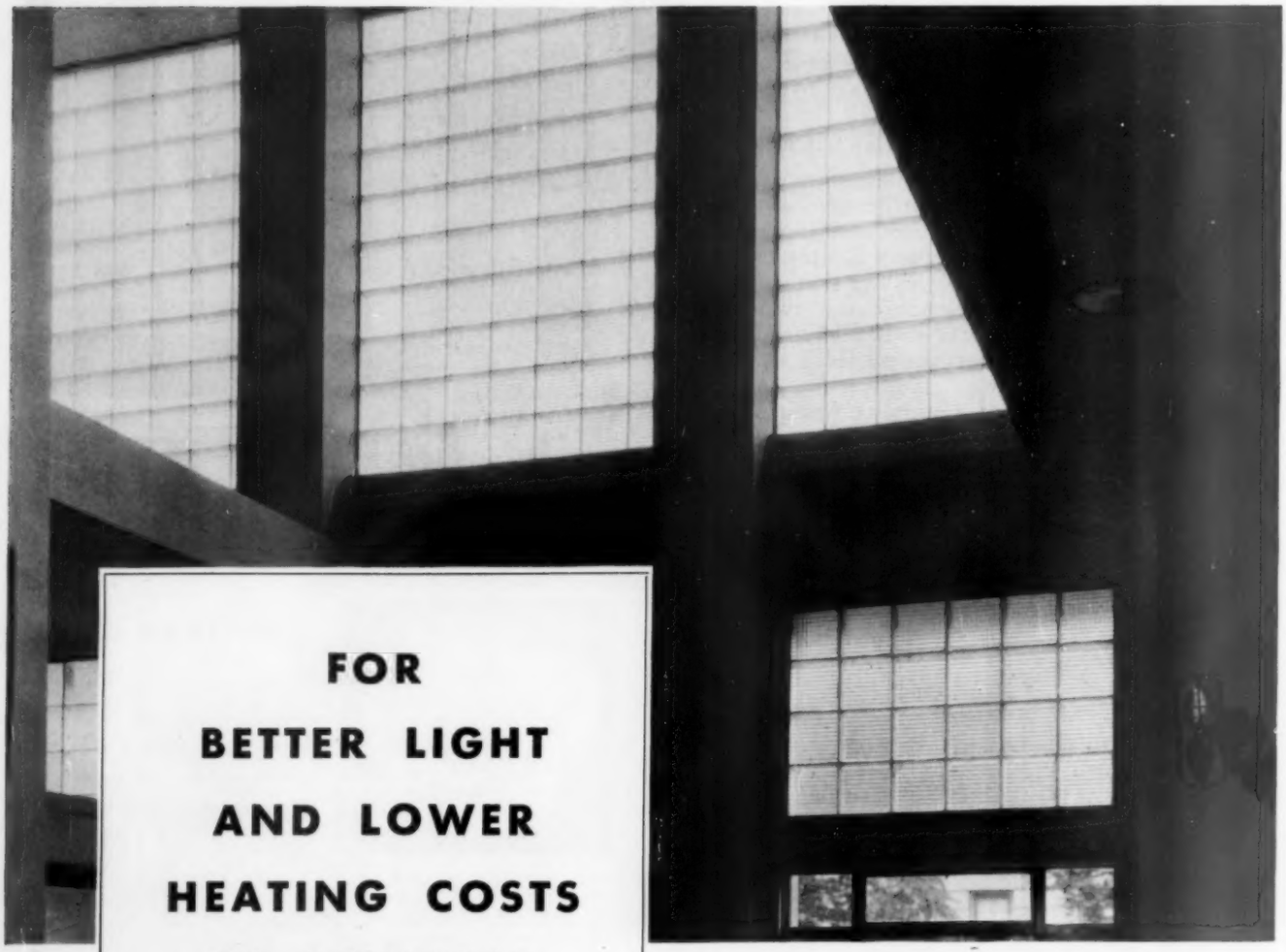
PITTSBURGH CORNING CORPORATION

Grant Building Pittsburgh, Pa.

Distributed by

PITTSBURGH PLATE GLASS COMPANY

and by W. P. FULLER & CO. on the Pacific Coast



FOR BETTER LIGHT AND LOWER HEATING COSTS IN SCHOOLS

A PC GLASS BLOCK PANEL, *illustrating how this modern material not only transmits light generously, but also presents an attractive, eye-catching appearance wherever used. The blocks in this panel are of the PC Argus pattern*

PC *Glass Blocks* offer many advantages which make them particularly suitable for use in school buildings of all types. They represent the modern method of improving school lighting conditions without the attendant increase in heating costs which is usually involved when greater glass areas are employed.

PATTERNS: PC Glass Blocks are available in two standard patterns . . . the "Decora" and the "Argus" . . . both unusually attractive in appearance. (See illustrations.) All decoration on the blocks is confined to the inside surfaces, leaving exposed faces smooth and easily cleaned.

SIZES: Each pattern is available in two sizes: 7¾" x 7¾" x 3⅞" and 5¾" x 5¾" x 3⅞". There is a companion radius block for each pattern for use at corners.

GENERAL QUALITIES:

Light Transmission: PC Blocks transmit 78% of the light incident on them. They are made of high transmission, crystal clear glass. The diffused light they transmit means that school rooms are better lighted, that students are less troubled by eye-strain. In laboratories, studios, gymnasiums, dormitories, libraries, class rooms, study rooms, etc., the use of PC Blocks proves especially advantageous.

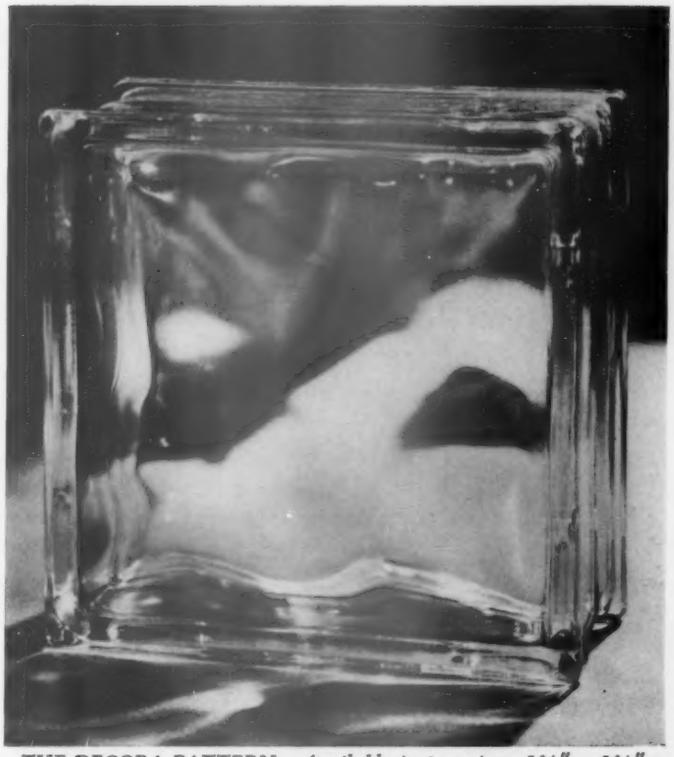
Heat Insulation: PC Glass Block panels have considerably greater heat insulating properties than ordinary windows . . . their insulation value is **double** that of single glazed window sash. This quality results in substantial savings in both original and operating costs of heating equipment for schools over other types of construction admitting an equivalent amount of light.

Sound Deadening: This material, when laid up in panels, has good sound insulation properties, being superior in this respect to other forms of masonry construction of equal weight per unit surface area. Compared with single glazed sash, PC Glass Block panels are decidedly superior, and substantially improve acoustics of rooms where they replace glazed sash.

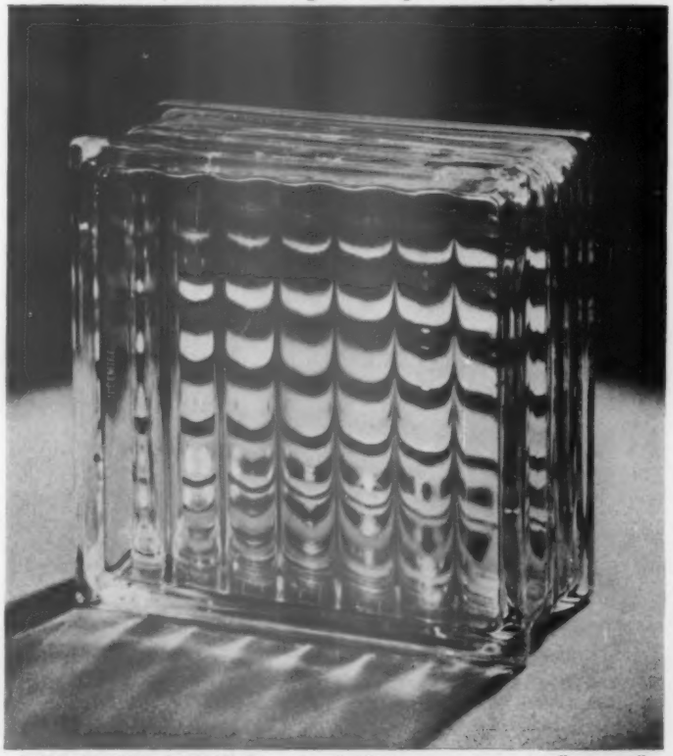
Beauty: PC Glass Blocks add immeasurably, not only to the exterior appearance of school buildings of every type, but to the interior beauty of the rooms as well. The scintillating, gleaming surfaces of the blocks as the light strikes them create an effect as lovely as it is restful. The fact that PC Glass Block panels are opaque is also conducive to study and concentration, with students undistracted by outside views.

Add to these advantages the facts that PC Glass Blocks require little or no maintenance and are weather-proof, water-tight, strong and durable, and it is obvious that they provide a new and better material for school and college construction.

PC Glass Blocks are manufactured by the Pittsburgh Corning Corporation, also makers of Carrara Structural Glass. They are distributed through the branches of the Pittsburgh Plate Glass Company, located in principal cities east of the Rockies, and by W. P. Fuller & Co. on the Pacific Coast. For further information on PC Glass Blocks, address Pittsburgh Corning Corporation, 2154A Grant Bldg., Pittsburgh, Pa.



THE DECORA PATTERN. *Available in two sizes, 5¾" x 5¾" x 3⅞" and 7¾" x 7¾" x 3⅞" with a companion radius block for use at corners. This is a simple yet extremely attractive pattern, without any geometrical design. It creates a wavy, iridescent, ocean-wave effect as light strikes its facets*



THE ARGUS PATTERN. *Available in two sizes, 5¾" x 5¾" x 3⅞" and 7¾" x 7¾" x 3⅞", with a radius block for use at corners. Where a more formal, architectural design is desired, the fluted pattern of this block makes it eminently suitable. Interesting light effects are achieved with this pattern, too*

THE CHICAGO HARDWARE FOUNDRY CO.

SANI-DRI DIVISION

North Chicago, Illinois

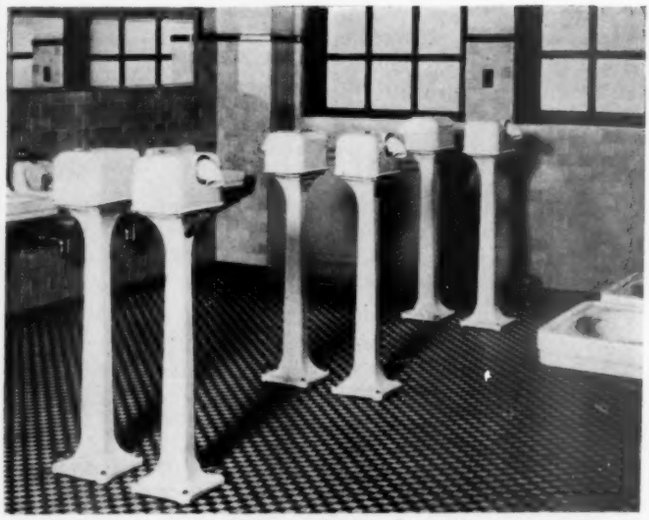
SANI-DRI

Encourage Good Hand-Washing Habits With SANI-DRI

School officials have been quick to recognize the advantages of SANI-DRI electric air driers in fostering the development of desirable hand-washing habits on the part of pupils from the kindergarten up.

In the kindergarten, where special washroom facilities are provided for the use of small children, a SANI-DRI installation has a fundamental advantage as it **thoroughly** dries little hands that have not yet attained sufficient manipulative ability for the use of towels.

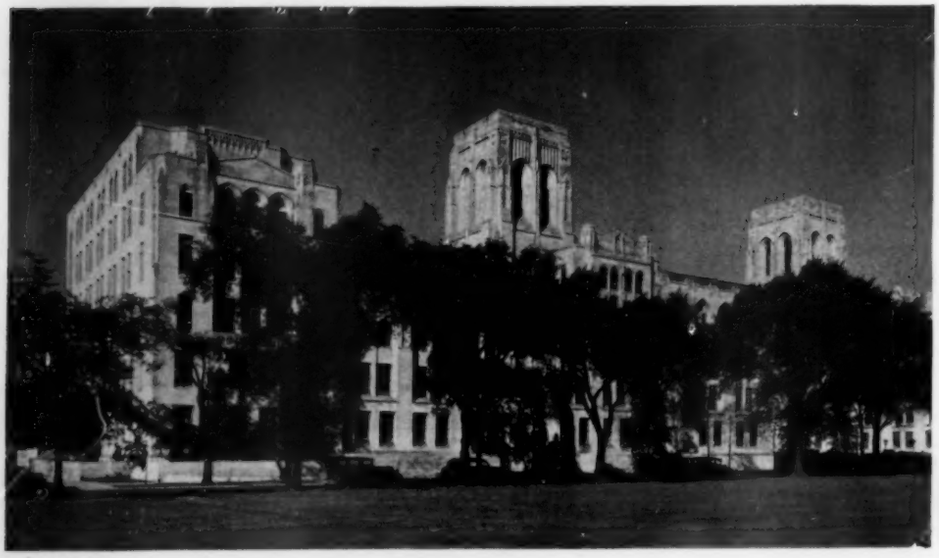
In the general washroom, SANI-DRI does away with the vexing problem of litter; at the same time it provides a complete, sanitary hand-drying service. The school architect who specifies a SANI-DRI installation is assured that the beauty of the washroom will be preserved in its original architectural conception. The school executive who demands complete sanitation in the washroom, finds his problem more satisfactorily solved with SANI-DRI than in any other way. Pupil habits of personal cleanliness are fostered, and it is easier to cultivate pride in the appearance of the washroom. Pupils often waste towels, too—when there are towels to waste. SANI-DRI gives no occasion for the development of wasteful, careless or untidy habits.



A SANI-DRI INSTALLATION—Note the clean, sanitary, unlittered condition of this room

In the cafeteria washroom, a SANI-DRI installation is appreciated because in addition to providing continuous service and promoting washroom tidiness, it meets the demand for a high standard of **sanitation** in hand drying.

In swimming pools, shower rooms and in modern home making departments where beauty culture courses include instruction in care of the hair, SANI-DRI is particularly useful as it is unexcelled for hair drying. SANI-DRI allows pupils to arrive at their next classes without disruption of class schedules, and, most important, **colds** due to wet hair are eliminated.



SANI-DRI

1. solves the problem of maintaining washroom cleanliness
2. assures complete sanitation in hand drying
3. encourages the development of good hand-washing habits
4. reduces shower room colds by drying hair thoroughly

At left **— THE UNIVERSITY OF CHICAGO CLINICS BUILDING — Washrooms equipped with Model "SF" SANI-DRI (illustrated and described on the following page)**

And in addition

SANI-DRI Is Economical

The outstanding advantages of the SANI-DRI method, together with the fact that its first cost is greater than that of towels, has misled many to think of it as expensive. On the contrary, SANI-DRI is **surprisingly economical.** Savings of 60 to 80% are assured.

Dries Quickly . . .
Prevents Chapping

Massaging hands lightly in warm air current thoroughly evaporates ALL moisture in 20 to 30 seconds. The electrically heated air stimulates the sebaceous glands, immediately restoring to the surface the skin-softening oils which afford full protection from chapping. There is nothing more stimulating after a dash of either hot or cold water than the reaction which comes from massaging the face over the flow of electrically heated air from SANI-DRI. Drawn through a fine mesh filter screen, this invigorating flow is absolutely clean and pure. With the nozzle turned up, SANI-DRI directs a flow of air V-like over sides of face, leaving the skin soft, free from moisture, glowing with new life. Especially refreshing on a hot day.

For face drying

Our engineers assure a yearly average NET saving of 60 to 80% of the cost of drying by the towel method. Mr. George F. Womrath's book on School Business Administration cites a NET saving of 68% over the cost of drying with linen towels, allowing 10% depreciation per year. His report follows:

"The use of electric air drying machines versus linen or paper towels may be included under modernization procedures.

"The time required per wipe is approximately 35 seconds with either linen towels or hot air. If towels are conveniently available, 65 per cent of the students in a schoolhouse will use them. On the basis of 100 per cent service, which means the supplying of enough towels to allow every student and teacher the use of a clean towel as often as needed, experiments have yielded data which indicates the use of electric air drying machines will net a saving of 68 per cent of the cost of linen towels in a school building housing 1,077 pupils.

"Cost of linen towel service on 100 per cent basis: 700 towels per day (65 per cent of 1,077) or 3,500 towels per week, at 40¢ per 100 for 35 weeks		$532.00	
"Cost of electric air drying: 10 machines at $110 and depreciated 10% per year	$110.00		
"Current per wipe $.00042, and 3,500 wipes per week for 38 weeks	55.86	165.86	
"Saving per year		$366.14	68.8%

(Reprinted from an article by Mr. Womrath on "Modernization of Old School Buildings," which appeared in The American School and University.)

For hand drying

The "SF" Model
SANI-DRI

In all types of educational buildings, the Model "SF" SANI-DRI provides a lasting, sanitary and economical drying service for washrooms. It is equally well adapted for installation in washrooms of new buildings or modernization of those in existing buildings. Installation is quickly and easily made.

The workmanship and materials used in the construction of this Model "SF" are of such quality that fifteen to twenty years of continuous service is assured. This long service makes possible a yearly average NET saving of 60 to 80% in providing drying service. The proper height of the "SF" permits of comfortable face drying, without stooping or stretching. Turn the nozzle up for face drying; down for hand drying.

A complete installation of "SF" Model SANI-DRI will supply an **always-there, sanitary, litter-free, economical** drying service.

The NEW "SR-W" Model SANI-DRI

This new semi-recessed modernistic-styled, wall model affords many advantages over previously marketed driers of this type, as briefly enumerated:

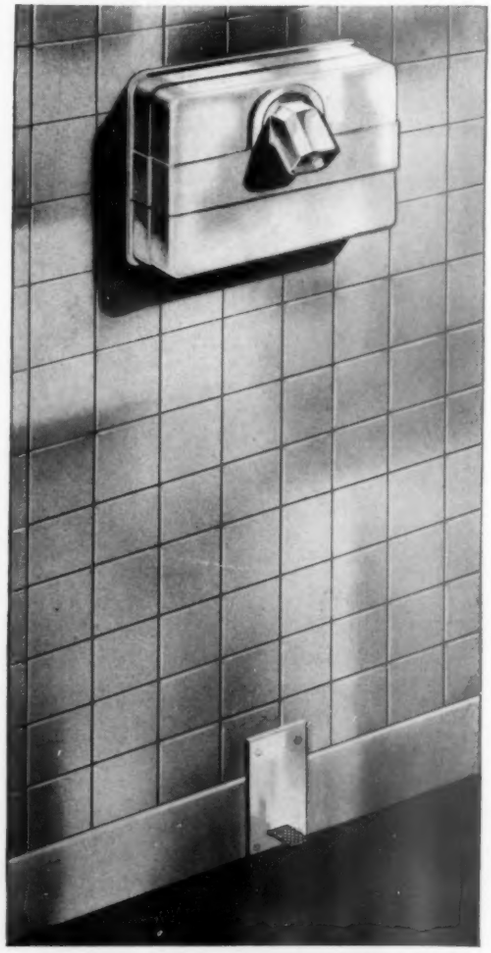
1. The solid cast iron box can be mounted in any wall finishing four inches or more in thickness.

2. All working parts are made accessible thru removal of two screws at bottom of cover. The inside depth of the box being but 3⅛", permits of any necessary adjustments without removing housing unit from the case.

3. The cast enbloc fan housing is mounted to **back of wall box,** instead of bottom, thus insuring perfect alignment of inside fan housing nozzle with outside, or cover nozzle; also, a close connection between the two nozzles.

4. All air is drawn in thru a screen located at bottom of cover instead of the front, as in previous models. Thru this horizontal mounting, rather than vertical, the law of gravity prevents screen from becoming clogged with lint from clothes.

5. The recessed wall model with foot-pedal operated switch insures simplicity of operation, yet freedom from any floor obstructions.



The NEW Model "SR-W" with foot-pedal control

SPECIFICATIONS
Model "SR-W"

AMPERAGE: Standard 13.5 amps. (17.5 amps. supplied on request.)

TEMPERATURE: On 13.5 amps. SANI-DRI provides approximately 150 degrees at nozzle discharge. (17.5 amps., approximately 170 degrees.)

AIR VOLUME: Air temperature and volume are effectively controlled through application of a Ward-Leonard resistor, thereby assuring uniform air temperature and volume under varying current conditions between 110 and 125 volts.

AIR FILTER: All air is drawn into bottom of cover through a heavy, non-rusting grid which prevents coarse lint and other foreign matter from entering fan.

FAN: A specially designed, one-piece **cast** aluminum fan provides more air than previously marketed electric driers.

SWITCH: The heavy, snap toggle switch of 30 amp. capacity (on 110 volts) is equipped with Micarta snuffers and contact wipers. Model "SR-W" is equipped with foot-pedal operated switch installed flush with wall.

HEATING ELEMENT: The heavily constructed heating element is made of the best grade of nichrome wire, assuring an average life of five to six years.

MOTOR: Westinghouse and General Electric universal type, one-sixth horsepower. Specially designed and constructed for SANI-DRI service and many years of constant use.

NOZZLE: A full turn swivel nozzle, adjustable to any position.

CONSTRUCTION: Exposed portion of drier is of best gray cast iron, porcelain enameled. Wall box is of 3/16-inch japanned, non-rusting, one-piece cast iron.

FINISH: One-piece front cover on "SR-W" model supplied in any desired color, in durable porcelain enamel. Standard colors—black, white and ivory; other colors supplied at slight extra cost.

TRIMMINGS: Solid cast brass, chromium plated.

WALL OPENING: 13½" x 8⅝". Unit can be set in any 4 inch wall, or over.

GUARANTEE: All SANI-DRI parts carry a one-year manufacturer's guarantee.

SPECIFICATIONS
Models "SF" and "SF-W"

MOUNTING—(Model "SF-W" only): This wall-mounted "SF-W" SANI-DRI, illustrated on following page, was designed for washrooms where only wall-mounted fixtures are desired. Also, and more particularly, for hair-drying service.

AMPERAGE: Standard 13.5 amps. (17.5 amps. supplied on request.)

TEMPERATURE: On 13.5 amps. SANI-DRI provides approximately 150 degrees at nozzle discharge. (On 17.5 amps. approximately 200 degrees.)

AIR VOLUME: Air temperature and volume are effectively controlled through application of a Ward-Leonard resistor, which assures uniform air temperature and volume under varying current conditions.

AIR FILTER: All air is drawn into cover through a non-rusting heavy grid that prevents coarse lint or foreign matter entering fan.

FAN: A specially designed one-piece cast aluminum fan provides more air than previously marketed electric driers.

SWITCH: The heavy, oversize, snap type toggle switch of 60 amp. capacity (on 115 volts) is equipped with Micarta contact wipers, controlled with foot pedal.

HEATING ELEMENT: The heavily constructed heating element, made with the best nichrome wire, assures an average life of five to six years.

MOTOR: Westinghouse or General Electric universal type, one-sixth horsepower. Specially designed for SANI-DRI service and built for years of constant use.

CONSTRUCTION AND FINISH: Entire exposed portion of drier is a gray cast iron base finished in an enduring, lustrous, porcelain enamel, such as employed in high grade plumbing fixtures. Standard colors—black, white or ivory. Special colors supplied at slight extra cost.

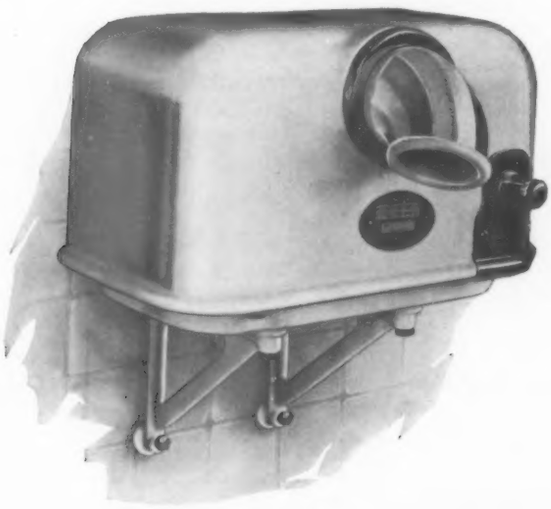
NOZZLE: A full turn swivel nozzle adjustable to any position.

TRIMMINGS: Are of solid cast brass, chromium plated.

GUARANTEE: All SANI-DRI units carry a one-year manufacturer's guarantee against defective material and workmanship.

The "SF-W" Model
SANI-DRI

This wall-mounted model especially designed for hair drying is also ideal for use in washrooms where floor obstruction would be objectionable. It provides an excellent hair-drying service for use in connection with swimming pools, shower rooms and dressing rooms because it dries quickly and thoroughly, making it possible for students to finish promptly and proceed to the next class. Schools providing swimming pools report that SANI-DRI electrical hair-driers greatly decrease the number of colds from "swim-wet" hair, and enable speedy clearance of dressing rooms and more rigid maintenance of class schedules.

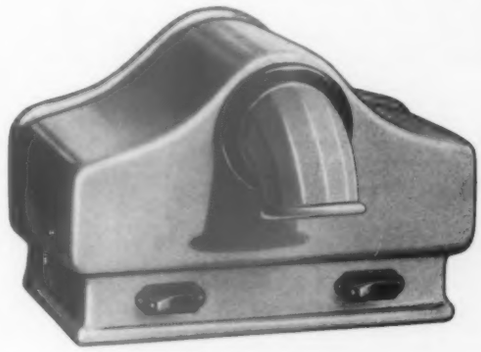


Model "SF-W" with push-button control and automatic cut-off

See preceding page for specifications

The "BA-W" Model
SANI-DRI Hair Drier

In appearance the "BA-W" model SANI-DRI distinctly differs from the standard "SF" model, but mechanically it provides the same efficient, dependable drying service for which SANI-DRI is well known. This low-cost model is recommended for washrooms operated under supervision of an attendant, or where the frequency of use does not warrant an investment in one of the larger, heavier models. It is easily installed in any convenient position desired, and conserves space in the small or crowded dressing room.



Model "BA-W" with manually operated Gaynor switch

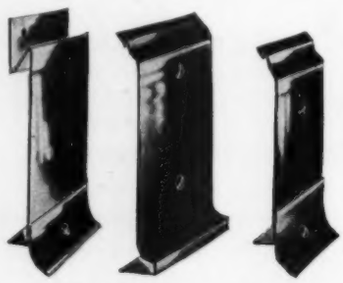
Various Models to Meet Varying Requirements

Owing to the fact that there is no standardized washroom or dressing room lay-out, varying washrooms require varying SANI-DRI equipment. After surveying your washrooms, we make specific recommendation of the model or models most suitable to the conditions.

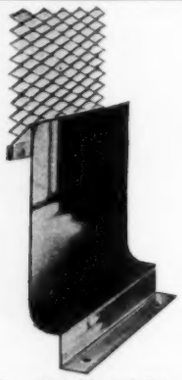
MILCOR STEEL COMPANY

Milwaukee, Wisconsin, 4153 W. Burnham St. — Canton, Ohio
Chicago, Illinois — Kansas City, Missouri — La Crosse, Wisconsin

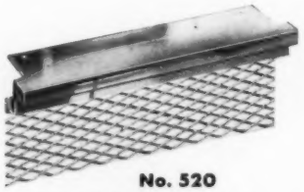
MILCOR INTERIOR METAL TRIM



No. 631 No. 645 No. 643
Metal Bases Without Wings

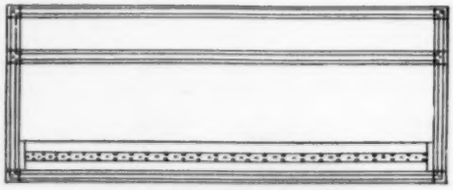


No. 600 Metal Base
With Expansion Wings

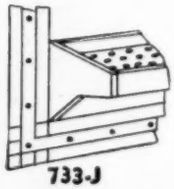


No. 520
Metal Window Stool
With Expansion Wings

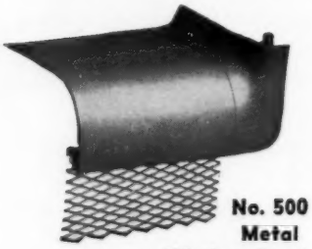
No. 762
Chair
Rail



Practical Blackboard Design
Using Milcor Moulds



733-J



No. 500
Metal
Window Stool

Left End Stop for
Chalk Trough No. 733 (Left)

No. 752
Chair
Rail

The Finest and Most Complete Line of Metal Trim Available

Milcor Metal Trim provides the best possible construction for school buildings. Permanence, firesafety, and resistance to use and abuse are features which should be given prime consideration in the building of schools, and these are inherent advantages in the Milcor Line of Interior Metal Trim.

Every desirable type of metal window trim and stool may be found in the Milcor Line, and numerous different installations may be achieved by combining various designs, mouldings and bases. All Fittings are welded to the trim at the factory, an important, exclusive feature.

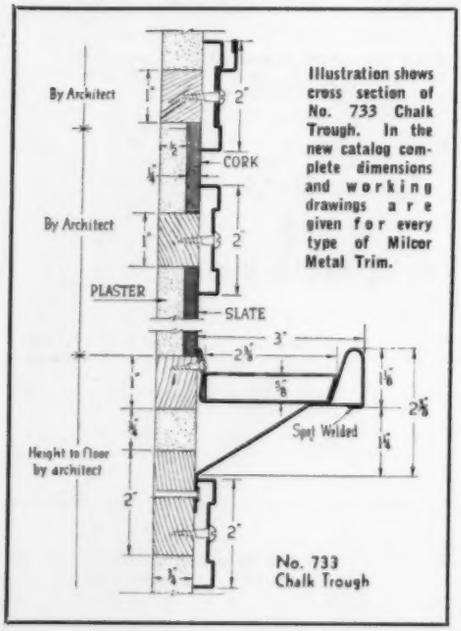


Illustration shows cross section of No. 733 Chalk Trough. In the new catalog complete dimensions and working drawings are given for every type of Milcor Metal Trim.

Milcor Metal Trim is attractive in appearance, sanitary, economical, easy to keep clean and to maintain. It is obviously so much better looking than the old heavy wood trim, that comparison is unnecessary. But even more important than its appearance are the many practical advantages which make it the ideal trim for schools.

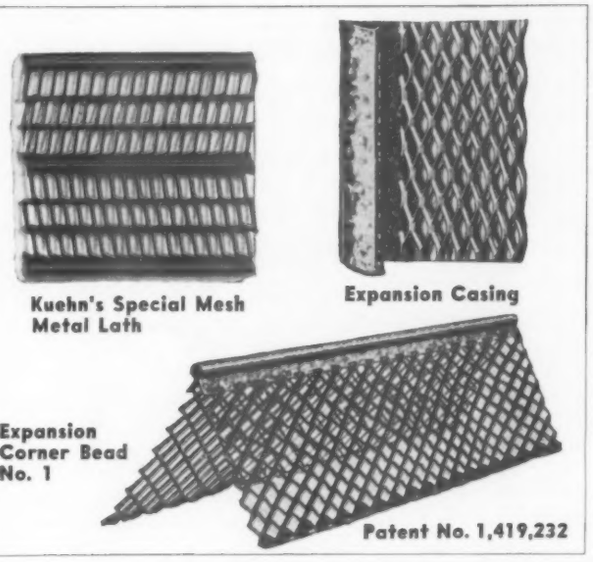
The Expansion Wing, which is a feature of many Milcor Products, provides a permanent plaster bond, preventing checking and cracking of plaster at vulnerable points. And in schools, especially, it is desirable to preserve the original plastered surface.

Products particularly adapted for school buildings are Metal Bases, Metal Cove Moulds, Metal Chair Rails, Metal Blackboard Moulds, and Metal Chalk Troughs.

Send for our new Catalog No. 100-B, Specification Manual

MILCOR PRODUCTS
Save with Steel — TONCAN — RMC — ANACONDA — Copperalloy Steel

MILCOR PRODUCTS for SCHOOLS



There is no better plaster base for walls and ceilings of school buildings than metal lath. And there is no better metal lath than Kuehn's Specialmesh. Its scientifically designed mesh gives it a positive plaster grip. There is no plaster waste with this lath, and yet every inch of wall surface is locked permanently into place.

Expansion Casing provides a practical door and window trim. The flush-tight junction of wall and casing insures a sanitary finish, with no cracks to become clogged with dirt.

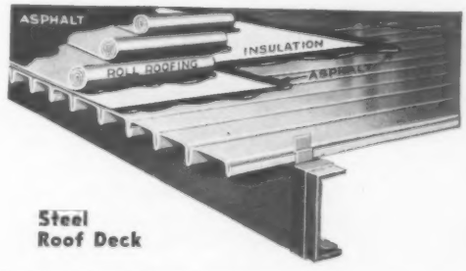
Milcor Expansion Corner Bead is made for outer and inner angles, and its precisely true nose makes a neat, safe, straight-lined corner. The expanded wing, an integral part of the bead, permits the plaster to key through and form a strong bond with the lath beneath, protecting against corner cracks either from blows or strain due to settling.

The Milcor "Nu-Air" is a steel top syphon Ventilator. Breakers and deflectors inside the wind band produce positive suction regardless of wind direction, and insure against back draft at all times. Its design takes into consideration all influencing conditions and compels it to function whenever and wherever there is air movement.

The Milcor "Spinner" Ventilator has great exhaust capacity. The slightest breeze keeps it operating efficiently. As the blades turn, the air in the ventilator head is expelled, creating a vacuum which draws the impure air from the building. Down drafts are an impossibility with this construction.

The Milcor Line of Skylights covers all types and sizes. We furnish recommendations to meet special requirements.

Send for Architectural Sheet Metal Guide No. 24-A describing and illustrating Milcor Ventilators and Skylights



Spanish Metal Tile is a popular roof for schools. It is light in weight and requires only a light supporting structure. It may be finished in any color desired and lends itself ideally to the general artistic scheme of the building. It is fireproof and lightning-proof.

There is an increasing use of Steel Roof Deck because of its many outstanding advantages. It is light in weight, simple to install, has a wide range of application, and is firesafe. Any standard composition roofing may be applied over it. Our Engineering Department will supply all necessary details if roof plans are sent in.

Metal Ceilings are still the most practical material for remodeling school interiors. They are fire-safe, economical and durable; easily cleaned, and vibration, jolts or settling strains do not affect them. The Milcor Line of modern designs includes every desirable type. Send for new booklet.

ANDREW HOFFMAN

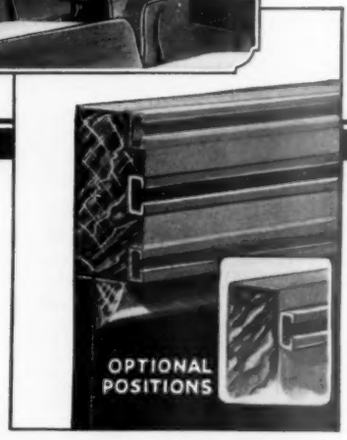
5034-5038 State Street, Chicago, Ill.

THE IDEAL MAP AND DISPLAY RAIL

USED IN SCHOOLROOMS, OFFICES, CONFERENCE ROOMS, HOSPITALS

The Andrew Hoffman display rail is applied to the walls on old or new trim at a convenient height, for the purpose of hanging map cases, maps, charts, posters, bulletins, drawings, and things of a similar nature.

Display rail	**15¢ per foot**
Solid bronze hook	**10¢ each**
Combination bronze hook ...	**7¢ each**



Description

This display rail consists of a substantial steel rail of special channel section, in which slide hooks and clips. In schoolrooms, the rail is screwed to the trim at the top of the blackboards. In rooms without blackboards, it is screwed at a convenient height to trim, grounds, or directly to the wall. The screws, which we furnish, are closely spaced for maximum strength.

To provide for the most efficient hanging of various objects, there are three types of hooks: one of very strong one-piece bronze construction that will support the heaviest map cases without turning or twisting—furnished, one to each 5 ft. of rail; and a lighter spring-steel combination hook and spring clip that supports lighter maps, charts, posters, bulletins, etc.—furnished, one to each 1½ ft. of rail.

Either hook may be removed from the rail by lifting it out through the notch. The bodies of hooks are **inside** rail; consequently hooks slide freely without interference, and appearance is neater. Additional hooks may be inserted through the notches.

Available also is a spring fastener which is inexpensive, and can be easily inserted, moved along the rail or taken out.

Finish

The display rail is finished in statuary enamel to harmonize with the trim customarily used.

Sizes

The display rail comes in sections 30 in. long. It is ⅞ in. wide and 5/16 in. deep. If the rail is to be mortised, the mortise should be only ¼ in. deep to prevent hooks scratching the trim.

Advantages

This display rail is designed and built to give a lifetime of satisfactory and trouble-free service.

Thumb tacks and cork pads are eliminated by the use of the combination hook and spring clip. When the spring hook is lifted, the poster, etc., may be placed beneath, where it is held firmly, yet without injury, by spring pressure, which is, we believe, the only permanently satisfactory method.

The rail may be mortised or rabbeted in any position on the face of the trim or may be screwed to the surface. The rail should be mortised in a groove to attain the most attractive appearance. A mortised rail blends into the ensemble so completely as to be very inconspicuous. See the optional positions in small drawing.

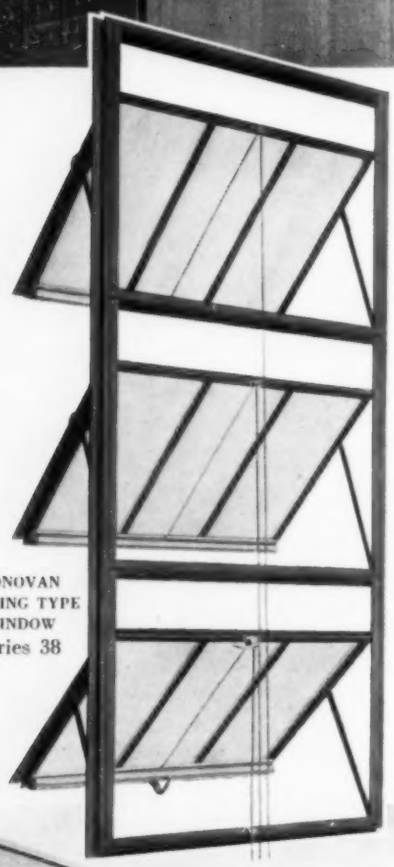
The sections of the rail are self-aligning, through the use of the dovetail joint, thus assuring the smooth passage of the hooks and clips. Being firmly fastened with screws, the rail cannot pull loose.

It is extremely versatile in its use: the two different hooks provide for the display or hanging of anything from a sheet of paper to a map case weighing 100 lbs.

TRUSCON

STEEL BUILDING PRODUCTS *for* SCHOOLS AND UNIVERSITIES

TRUSCON STEEL COMPANY - - Youngstown, Ohio



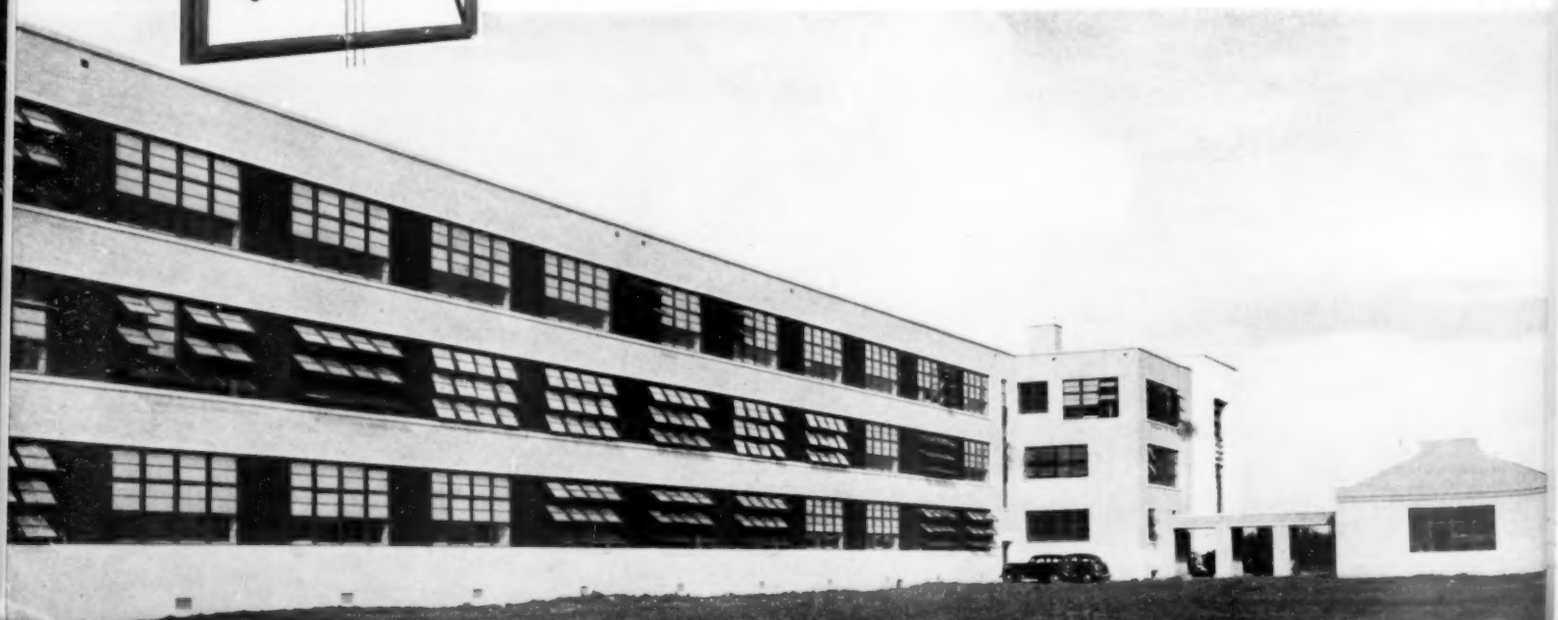
DONOVAN
AWNING TYPE
WINDOW
Series 38

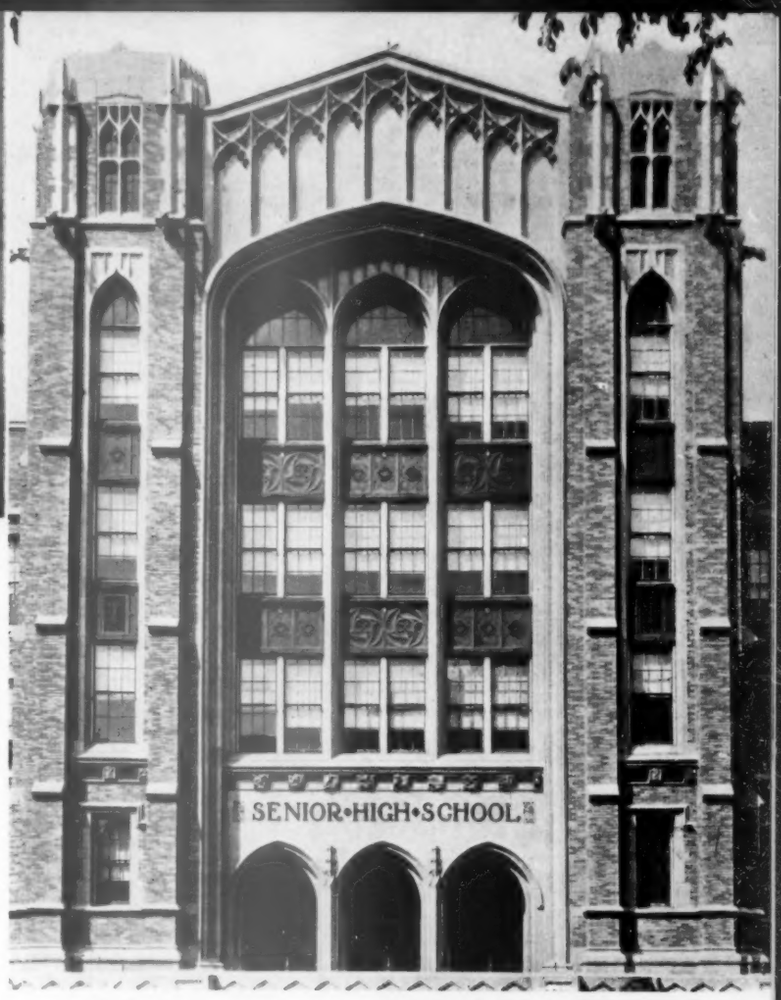
TRUSCON DONOVAN AWNING TYPE STEEL WINDOWS

Scientific approach to the important factors of daylight illumination without sun glare and natural ventilation without drafts is provided by TRUSCON Donovan Awning Type Windows. Their moderate cost makes Truscon Donovan Windows a practical specification for schools, hospitals, offices, public buildings and similar structures. (Donovan Windows frequently remove the need for expensive plenum systems with appreciable savings in cost.) In each Donovan unit the ventilating windows open simultaneously, deflecting the air upward into the room. However, by disengaging the clutch, the lower ventilator may be opened or closed independently of the upper ventilators as is sometimes desired in inclement weather. Shades are attached to the *bottom* rail of each ventilator. Shades roll *down* when not in use.

●

Illustrations on this page: Mirabeau B. Lamar Senior High School, Houston, Tex.
John F. Staub, Kenneth Franzheim, Inc., Louis A. Glover, Inc.,
Lamar Q. Cato and Harry D. Payne, Associated Architects.





Senior High School, Quincy, Illinois
John D. Chubb, Architect
George P. Behrnsmeyer, Associate Architect
Truscon Double-Hung Windows.

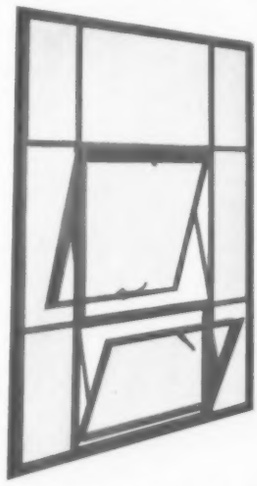
TRUSCON DOUBLE HUNG STEEL WINDOWS

Proper daylighting and ventilation in educational buildings determine, to a large extent, the efficiency of their operation. Truscon Double-Hung Steel Windows have proved exceedingly popular for buildings of this type. Their clean cut lines enhance the beauty of any building. Their narrow members increase the daylighting through window openings. Their superior workmanship, finish and hardware adapt them for the finest buildings. In addition Truscon Double-Hung Windows are permanent, fire-resistant and exceedingly easy to operate.

•

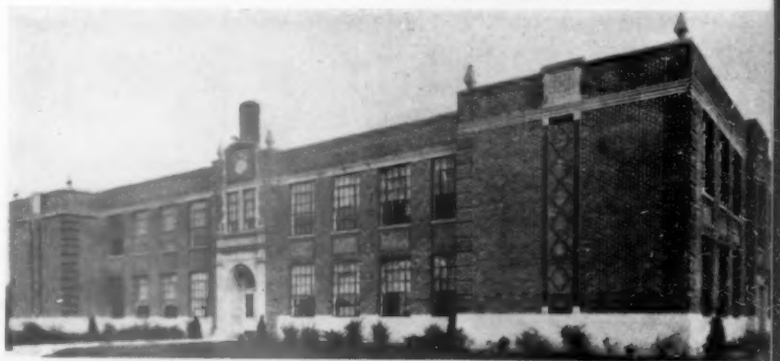
TRUSCON PROJECTED STEEL WINDOWS

Truscon Projected Steel Windows are designed for architectural appearance as well as for practicability. This type of window is especially recommended for use in school buildings where sufficient ventilation, daylight and freedom from drafts are necessities. Outward projecting ventilators may be kept open during rainy weather, the ventilator acting as a canopy to deflect the rain and yet allow ventilation. The lower inward projecting ventilators prevent drafts by deflecting air currents toward the ceiling. The projecting ventilators of these windows permit easy cleaning from the inside of the room.



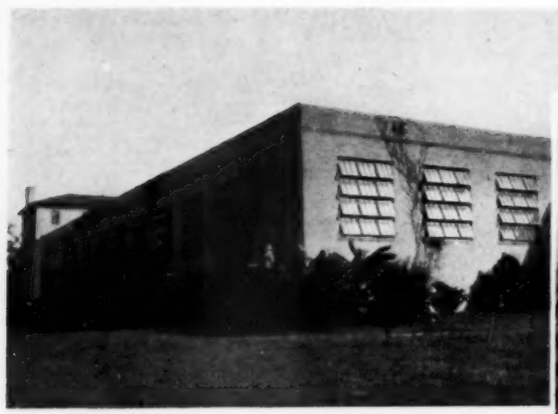
PROJECTED WINDOWS

DOUBLE-HUNG WINDOWS



Malinta-Grelton School, Malinta, Ohio
S. P. Stewart and Son, Architects
Truscon Projected Steel Windows, "O-T" Joists and Reinforcing.

Permanent and Satisfactor



Louisiana State University, Baton Rouge, La.
Field House and Recreation Building
Weiss, Dreyfous & Seiferth, Inc., Architects.

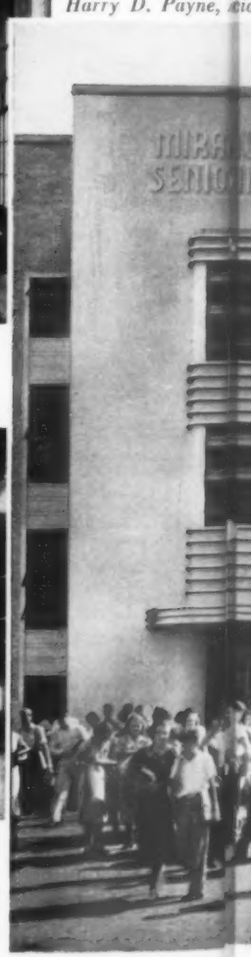
Bryant School, Minneapolis, Minn.
Bureau of Buildings,
Div. of Design and Inspection, Archts.

Below: Kent Sch
Ronan and Ingles

School building, Pomeroy, Iowa
Dougher, Rich and Woodburn, Architects and Engineers.

Public School, Philadelphia, Pa.
I. T. Catherine, Architect.

Below: Mirabeau La
John F. Staub, Ka
Louis A. Glover, I L
Harry D. Payne, Ar



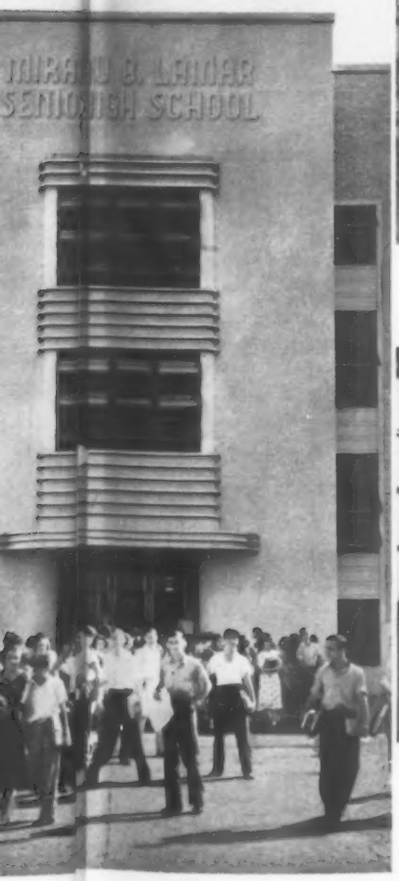
St. Hedwig's Industrial School, Niles Center, Ill.
Sandel & Company, Architects.

Left: Lincoln School, Lincoln, Illinois
Dean & Ginzell, Architects.

ory Installations Everywhere

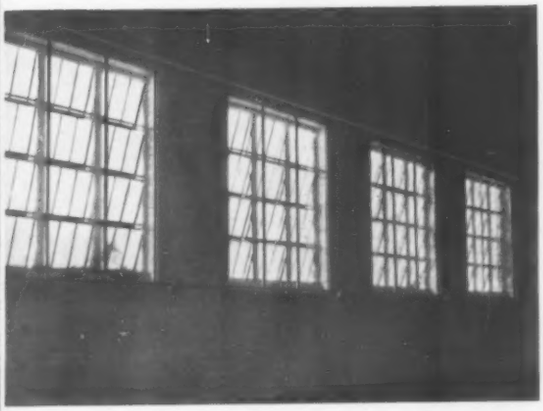
Kent State Normal College, Kent, Ohio
and Ingle, Architects.

Mirabeau B. Lamar School, Houston, Tex.
Staub, Keith Franzheim, Inc.,
Glover, Lamar Q. Cato and
Payne, Associated Architects.



Wellesley College, Munger Hall, Boston, Mass.
William T. Aldrich, Architect.

Jefferson High School, Lafayette, Indiana
Walter Scholer, Architect.



Louisiana State University, Baton Rouge, La.
Interior of Field House and Recreation Building.

University of California, Berkeley, Calif.
Engineering Laboratory
Geo. W. Kelham, Architect.

Roosevelt Junior High School, Newark, Ohio
Vernon Redding and Associates, Architects.

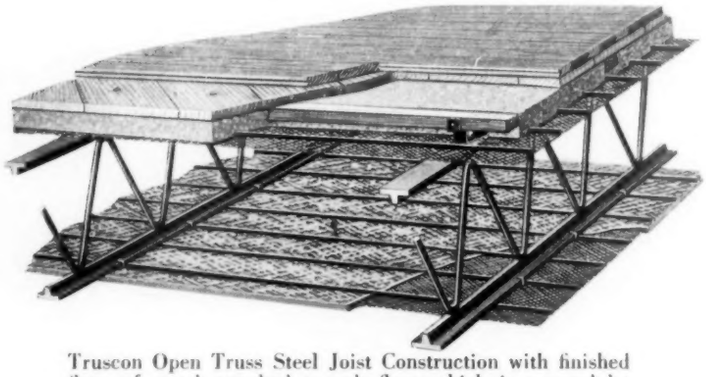
Right: Ann J. Kellog School, Battle Creek, Mich.
Albert Kahn, Inc., Architects.

Negro College, Pine Bluff, Ark.
Thompson-Sanders & Ginnochio, Architects
Truscon "O-T" Steel Joists, Rib Lath, Reinforcing and Steeldeck Roof.

TRUSCON "O-T" JOISTS FOR FIRE-RESISTANT FLOORS

Necessity for fire safety in school construction has been impressed upon the public mind by many tragedies. But not only must outside walls and roof be planned for fire resistance but it is vital that the floor must provide adequate protection from fire.

Truscon Open-Truss Steel Joists insure not only fire resistance of the highest type but also strength, rigidity and sound-proofness. Steel joist construction is quickly erected without forms or centering. Its light weight effects savings in the supporting structural work, thus augmenting the economy of its initial low cost.



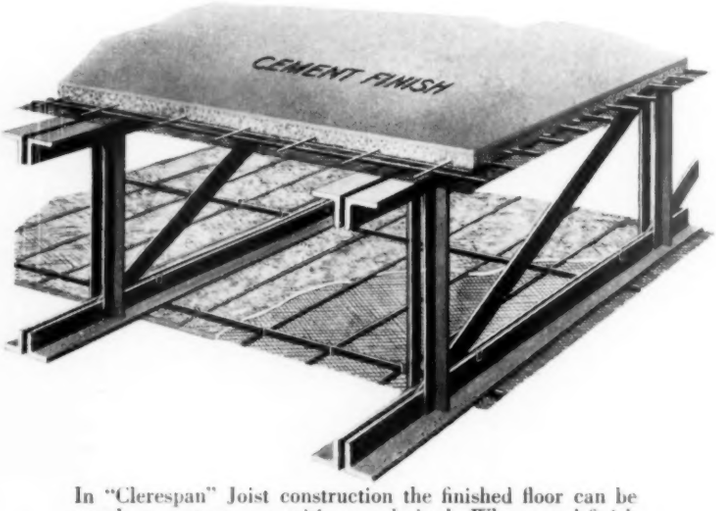
Truscon Open Truss Steel Joist Construction with finished floor of wood attached to sub floor which is secured by means of screeds placed at right angles to the joists and elevated by screed clips to provide for concrete underneath.

•

CLERESPAN JOISTS FOR UNOBSTRUCTED FLOOR AREAS

Truscon "Clerespan" Joists can be used with equal satisfaction in either floors or roofs, and they can be used on spans greatly in excess of any heretofore attempted in this type of construction. Elimination of columns is a feature that has elicited much favorable comment, permitting the unobstructed use of floor area.

Truscon "Clerespan" Joists are made from hot rolled structural steel shapes with all connections secured by means of electric welding.



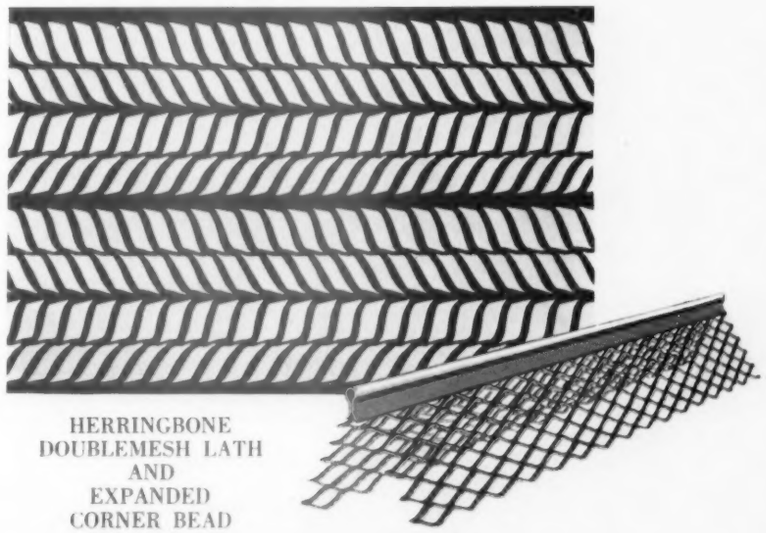
In "Clerespan" Joist construction the finished floor can be wood, cement or composition, as desired. When wood finish floors are desired over a concrete slab, nailing screeds must be placed parallel to or at right angles to the joists. Screed clips are provided to hold the screeds and also to elevate them, thus permitting the concrete to flow under the screeds.

A. & T. College, Dudley Hall, Greensboro, N. C.
Charles C. Hartmann, Architect
Truscon Metal Lath, Steeldeck Roof, "O-T" Joists, Structural Steel and Reinforcing.

TRUSCON METAL LATH FOR FIRE AND CRACK RESISTANT WALLS AND CEILINGS

Truscon Metal Lath used as a plaster base assures permanent beauty to walls and ceilings by safeguarding them against cracks and other ugly discolorations. Metal Lath also provides the important advantage of fire-resistance. Fire originating in any part of a building can be confined to the place where it started if walls and ceilings have the protection of steel in the form of Truscon Metal Lath behind the plaster.

Truscon manufactures a complete line of Metal Laths and accessories which will meet adequately any and all plastering requirements.

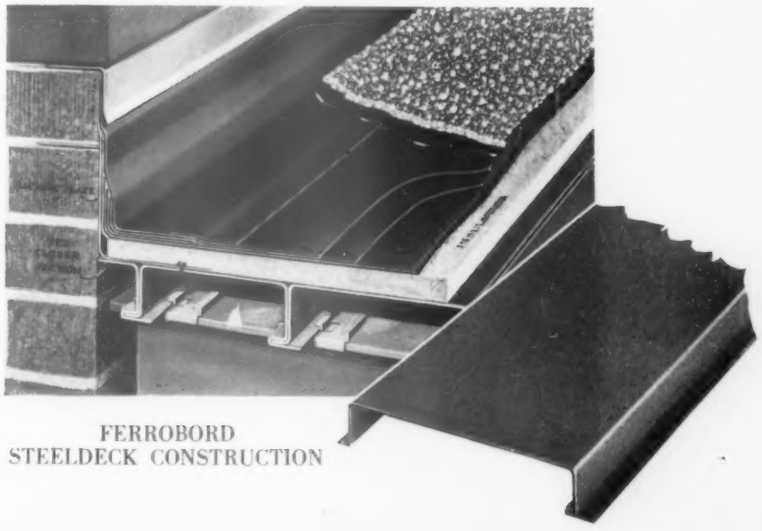


HERRINGBONE DOUBLEMESH LATH AND EXPANDED CORNER BEAD

TRUSCON STEELDECK ROOFS

(Insulated and Waterproofed)

Truscon Ferrobord Steeldeck Roof provides an economical, fire-resistant roof construction that assures a high degree of protection for building and equipment. Truscon Ferrobord Steeldeck Roof is much lighter in weight than other fireproof roof material. This permits savings in design of supporting framework plus the saving on their low cost of installation. This Roofdeck, properly installed and waterproofed, is firesafe and practically free from maintenance.



FERROBORD STEELDECK CONSTRUCTION

TRUSCON SALES OFFICES

ALBANY, N. Y.
75 State Street
ALBUQUERQUE, N. M.
107 S. 4th Street
ALTOONA, PA.
6 Log Cabin Court
ATLANTA, GA.
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CLEVELAND, OHIO
1505 Builders Exchange Building
COLUMBUS, OHIO
1000-04 Atlas Building
DALLAS, TEXAS
415 Construction Building
DAYTON, OHIO
30 S. Ludlow Street
DENVER, COLO.
820 Twelfth Street
DES MOINES, IOWA
Hubbell Building
DETROIT, MICHIGAN
615 Wayne Street
ERIE, PA.
309 Schenley Drive
FORT WAYNE, IND.
302 Old First Bank Building
GREENSBORO, N. C.
935 Jefferson Standard Building
HARRISBURG, PA.
600 North Second Street
HOUSTON, TEXAS
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INDIANAPOLIS, IND.
805 Union Title Building
JACKSONVILLE, FLA.
504-6 Hildebrandt Building
KANSAS CITY, MO.
204 Finance Building
KNOXVILLE, TENN.
705 General Building
LITTLE ROCK, ARK.
5224 "U" Street
LOS ANGELES, CALIF.
5480 East Slauson Avenue
LOUISVILLE, KY.
622 So. 5th Street
MEMPHIS, TENN.
586 Shrine Building
MIAMI, FLA.
1333 N. Bayshore Drive
MILWAUKEE, WIS.
6111-6115 Plankinton Building
MINNEAPOLIS, MINN.
738 Baker Building
NASHVILLE, TENN.
801 Nashville Trust Building
NEWARK, N. J.
605 Broad Street
NEW HAVEN, CONN.
42 Church Street
NEW ORLEANS, LA.
1143 Canal Bank Building
NEW YORK, N. Y.
155 E. 44th Street
NORFOLK, VA.
22nd and Manteo Streets
OKLAHOMA CITY, OKLA.
1 N. W. First Street
OMAHA, NEBR.
851 Insurance Building
PEORIA, ILL.
306 Lehmann Building
PHILADELPHIA, PA.
906 Architects Building
PHOENIX, ARIZ.
222 Luhrs Building
PITTSBURGH, PA.
2544 Oliver Building
PORTLAND, OREGON
2139 No. Kerby Avenue
RICHMOND, VA.
222 East Broad Street
ST. LOUIS, MO.
1005 St. Louis Mart Building
SALT LAKE CITY, UTAH
1526 S. West Temple Street
SAN ANTONIO, TEXAS
909 Builders Exchange Building
SAN FRANCISCO, CALIF.
604 Mission Street
SCRANTON, PA.
203 Colfax Avenue
SEATTLE, WASH.
907 Lloyd Building
SYRACUSE, N. Y.
642 Gurney Building
TAMPA, FLA.
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220 Richardson Building

WASHINGTON, D. C.
700 Investment Building

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FOREIGN TRADE DIVISION, Chrysler Bldg., 405 Lexington Ave., NEW YORK, N. Y.
TRUSCON STEEL COMPANY OF CANADA, Limited, WALKERVILLE, ONT.

Executive Offices and Plant:

YOUNGSTOWN, OHIO

Factories in: Cleveland, Ohio, Los Angeles, Cal., Walkerville, Ont.

THE BARRETT COMPANY

Manufacturers of Roofing and Waterproofing Materials

40 Rector Street, New York, N. Y.

2800 So. Sacramento Avenue
Chicago, Illinois

Birmingham
Alabama

PRODUCTS

Roofing Materials—For Flat Surfaces: Barrett Specification Pitch and Felt Roofs, Black Diamond Pitch and Felt Roofs. Tarred and Asphalt Saturated Felts and Fabrics, Coal Tar Pitches, Asphalt Cements, etc.

For Steep Surfaces: Barrett Steep Roof Pitch and Felt Roofs, Anchor Asphalt and S.I.S. Roofing. Barrett Asphalt Shingles and Roll Roofings. Roof Cements and Coatings.

Miscellaneous—Waterproofing for foundations, swimming pools, tunnels, floors, etc., special specifications submitted. Rock Wool Insulation, Insulating and Building Papers, for sheathing, lining, etc. Dampproofing and Preservative paints. Wood Preservatives. Tarvia-lithic for playground surfacing, roadways, paths and tennis courts. Roof Drain and Vent Connections.

For complete information about these and other products, write The Barrett Company, 40 Rector Street, New York City.

THE GREATEST NAME IN ROOFING

The proved fire-safety of Barrett Specification Roofs is of as much importance to school and university executives as the long-run economy of these famous roofs.

Barrett Specification Roofs carry Class A—base rating by the National Board of Fire Underwriters. Their gravel or slag surface is immune to fire hazard caused by flying sparks and embers.

Applied by Barrett Approved Roofers, who are selected on the basis of their experience, ability and integrity, Barrett Specification Roofs are bonded up to 20 years against repair and maintenance expense, and often last two or three times the term of their bonds.

These are factors which explain why Barrett Specification Roofs are chosen for thousands of America's finest school buildings. America is particularly careful of its children, and no other roof, it seems, so completely satisfies the exacting requirements of school and university builders. On any roofing or waterproofing problem, consult with us or your nearest Barrett Approved Roofer. Look in the Classified Telephone Directory under "Roofers."

FREE ROOF INSPECTION

For many years, The Barrett Company has offered building owners an unique service that has been the means of saving many thousands of dollars in upkeep expenses. On request, a Barrett Roof Inspector will make a careful survey of your roofs, flashings, copings, parapets, etc., and render a complete unbiased report. This service is free on buildings with roof areas of 5,000 square feet and up, located east of the Rockies.

Barrett Specification Roofs

The new, modern Ansonia High School, at Ansonia, Conn., is protected by a Barrett Specification Roof. Arch.: William Lescaze. Associate: Vernon F. Sears, New York. Gen'l Cont.: William L. Crow Construction Co., New York. Rfg. Cont.: G. R. Cummings Roofing Co., Meriden, Conn.

THE PHILIP CAREY COMPANY

Manufacturers of

Roofing and Waterproofing Products, Heat Insulations

Lockland, Cincinnati, Ohio

The roof of a school building represents little more than 1% of the total construction cost yet on its durability and weather-resisting qualities depend the protection of the other 99%. The school roof should be designed and built to last the life of the building. Re-roofing is an expense that need not be incurred under ordinary conditions if the right roof is selected and properly constructed.

SPECIFY

Carey ROOFS

FOR LASTING PROTECTION

Carey Roofs meet every requirement for modern school construction. For more than sixty years Carey Roofs have been specified for important public buildings throughout the United States, and their application to new school construction is increasing year by year because they have proved their durability and lasting protection against weather.

The quality of materials entering into Carey Built-Up Specifications are carefully checked by our engineering department and research laboratory, allowing a liberal factor of safety as to tensile strength, number of plies and thickness of plies, to assure adequate and permanent weatherproof protection.

FREE ROOF SURVEY

The Carey Roof Survey Plan has been in operation for several years and has been the means of cutting roofing upkeep expense to a minimum. Without obligation on your part, a Carey Inspector will make a careful survey of your roofs, flashings, parapets, etc., and give an honest and impartial report on their condition.

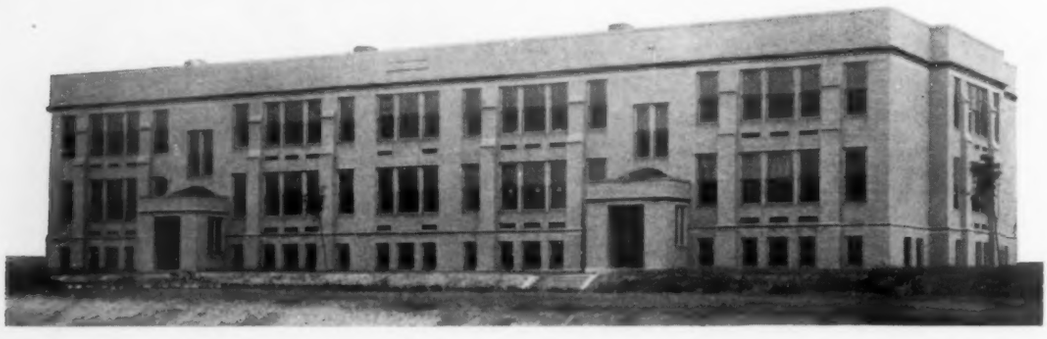
Carey Asfaltslate Shingles represent the standard of quality in composition shingles. They are built especially rugged and substantial to give extra years of trouble free service. They are proof against all ordinary fire risks and need no paint or other upkeep expense. Be sure to see the Carey Cork Insulated Shingle which is constructed to provide roof insulation that is automatically applied at the same time the roof is put on.

Careystone Asbestos Cement Shingles. Made of asbestos and cement, it provides a permanent roof possessing natural properties that enable it to resist the destructive influences of time, weather and fire.

Carey Heat Insulations. For low pressure steam or hot water heating systems, Careycel Pipe Covering has no equal. It combines high insulating efficiency with low cost. The Carey Heat Insulation Line is complete. A special insulation material to meet every service condition. Temperature ranges from zero to 2500° F.

Carey Waterproofing Materials. Carey waterproofing product for basement walls and swimming pools; Protective coatings to repair leaks and prolong the life of all types of roofs, protection paints for hot and cold metal surfaces.

For complete information on Carey Roofs and other products, write The Philip Carey Company, Lockland, Ohio.



The RUBEROID Co.

Roofing and Building Products

EXECUTIVE OFFICES
500 Fifth Avenue, New York, N. Y.

DIVISIONAL OFFICES
NEW YORK · CHICAGO · BOSTON (MILLIS) · ERIE · BALTIMORE · MOBILE

For more than fifty years The Ruberoid Co. has manufactured a wide variety of quality roofing and building products. Among these products are a number of particular interest to architects and engineers who draw plans for schools and universities.

ASBESTOS-CEMENT SHINGLES FOR PITCHED ROOFS

Where beauty is a factor, where a roof must be waterproof, fireproof, rotproof and time-defying—Eternit Asbestos-Cement Shingles win favor with the architect. These shingles, Ruberoid-made, come in various finishes, designs and colors. One of the most popular is the Eternit Gothic. The texture of Gothic is like that of natural rock in which has been carved by years of exposure to the elements, fascinating designs. Its luxurious appearance is duplicated only in the most expensive types of natural slate or stone.

Tapered with a heavy butt, the Gothic Shingle lies perfectly, giving the effect of massiveness and yet without the burden of extra weight. Eternit Gothics are furnished in random widths and may be applied with staggered butts. The shingle is 12″ wide and 16″ long with approximately 5/16″ butts. Applied with 7″ x 12″ exposure. Weight approximately 525 lbs. per square.

The companion Asbestos-Cement Shingle is Eternit Timbertex. This product reproduces the lovely texture of weather-aged cypress. It has all the qualities of the Gothic, but gives the effect of mellowed wood. Its size is 8″ x 16″, with approximately 1/4″ thick butts. The exposure is 8″ x 7″ and the weight is 525 lbs. per square.

Where a less expensive, yet durable, fire-resisting roof is required, Ruberoid can supply Asphalt Shingles in various weights, colors and designs. Full descriptive literature upon request.

ROOFS FOR FLAT SURFACES

When the roof is flat or has little slope, RU-BER-OID Built-up Roofs are recommended. There are four popular types of Built-up Roofing: Asbestos felt and asphalt, coal tar pitch and tarred felt, asphalt felt and asphalt, and the combination roof consisting of asphalt felt, asphalt-saturated asbestos felt and roofing asphalt. Ruberoid makes all of these types so that you can choose according to climatic conditions, proximity to fire hazards, construction of the roof deck, the proper type to meet any condition.

When desired, RU-BER-OID Built-up Roofs are bonded for 10, 15 or 20 years, depending upon the specifications. Bonded roofs are applied only by Approved Ruberoid Roofing Contractors. Complete Catalog will be mailed upon request.

INSULATING MATERIALS

From the viewpoint of efficiency, Rock Wool is one of the finest insulating materials. Ruberoid offers you Rock Wool in three forms—loose or bulk for packing, granulated for pouring and in pre-formed bats for use between joists, rafters and studding. Complete data will be gladly forwarded upon request.

ASBESTOS PIPE COVERINGS

Closely associated with temperature control is the proper insulating material to reduce fuel consumption. The Ruberoid Co. has a complete line of heat and cold insulating products, including Asbestos and 85% Magnesia Pipe Coverings, Asbestos Papers, Sheet and Block Insulations, Insulating Cements, etc.

NEWMARBLE AND NEWTILE WALL PANELS

Two asbestos-cement building products that are particularly popular for school use are Newmarble and Newtile Asbestos-Cement Wall Panels, simulating perfectly fine marble and ceramic tile. These wall panels have a lustrous finish, are easily kept clean and are ideal for kitchens, cafeterias, laboratories, shower rooms, etc. The Newmarble Wall Panels are excellent for use in lobbies, hallways, etc.

SAMPLES AND DESCRIPTIVE LITERATURE

The Ruberoid Co. will gladly forward samples or descriptive literature covering any of their products. Simply address your request to School Engineering Department, The Ruberoid Co., 500 Fifth Avenue, New York, N. Y.

WOOD CONVERSION COMPANY

Manufacturers of

NU-WOOD Interior Finish . . . and BALSAM-WOOL Sealed Insulation

St. Paul, Minnesota

Nu-Wood is the modern interior finish for schools that provides harmonious decoration, effective noise-quieting, correction of faulty acoustics, and insulation —all in a single material, at low price!

A beautiful—and quiet—classroom is provided by the use of Nu-Wood tile on the ceiling and Nu-Wood plank on walls

Nu-Wood comes in a variety of soft, pleasing colors, although it can be painted if desired. Available in tile, plank, board and wainscot, it makes possible the correct pattern combination for any type of school interior. Its remarkable noise-quieting and acoustical correction properties often eliminate the necessity for more expensive treatment. Nu-wood can make "hard-to-hear" rooms acoustically correct . . . render every spoken word audible, and hush extraneous noises. Nu-Wood's insulating efficiency helps to keep schoolrooms at a more even, healthful temperature all the year round, conserving fuel in winter and shutting out stifling heat when the rooms are used during summer months.

Complete facts about Nu-Wood for use in school classrooms, corridors, auditoriums, cafeterias and offices, are yours for the asking. Write for literature containing illustrations showing the use of Nu-Wood in modern school buildings.

ARCH ROOF CONSTRUCTION CO., INC.

Engineers and Contractors

Telephone
CHickering 4-3516

53 West 42nd Street, New York, N. Y.

DISTRICT REPRESENTATIVES

Chicago, Ill., R. H. Finley, 332 So. LaSalle Street—Telephone Harrison 5628
Cleveland, Ohio, The Carver-Behan Co., 1740 E. 12th Street
Los Angeles, Cal., Bert E. Anderson, 9129 W. Adams Street
San Francisco, Cal., Rolph, Mills & Co., Rialto Building

LONG SPAN ROOF ARCHES

SCOPE OF APPLICATION AND SERVICE

Design, Construction and Erection of **Long Span Roof Arches** for theaters; auditoriums; convention, exhibition and fair buildings; garages; warehouses; factories; airplane and dirigible hangars; gymnasiums; skating rinks; bowling alleys, and all buildings where unobstructed space, maximum light and ventilation are desired.

Arch Roof Construction Co., Inc., will design arches, supply all materials and do the erection, or ordinary materials can be supplied and erection done by local contractors. Co-operation is offered to architects, engineers and contractors in planning the most economical and efficient design for particular buildings.

A request will bring additional information.

FIELD BUILDINGS

Our field or sports buildings can be erected so they may be used for auditoriums, theaters, gymnasiums, ice hockey, etc. Buildings are easily interchangeable (without structural changes) permitting daily varied activities in one efficient structure, eliminating the need for several infrequently used buildings.

INDOOR TENNIS AND BADMINTON BUILDINGS

Indoor tennis, or badminton buildings, containing one or many courts, with perfect natural daylighting and artificial light, without glare; playing in direction of the arches to conserve building height and produce perfect buildings at a minimum of cost.

SPANS TO OVER 400 FEET

We use short lengths of the usual structural materials in the design and economical construction of buildings having spans up to **400 feet** or more, where unobstructed space (no columns, posts or trusses) is desired. Heights to suit.

STRENGTH

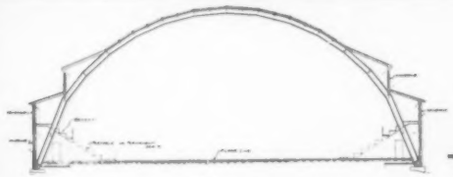
Arch roof construction can be of timber or steel or a combination of both. Standard structural shapes and sizes are employed in a patented design with patented connections to produce a roof of unusual strength. It may be fireproof, fire-retardant or non-fireproof.

DESIGN

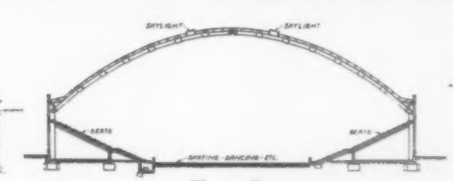
All our arches are scientifically designed as hingeless, one, two, or three-hinged arches, and any competent structural engineer can design and check our arches. In our design, ample provision is always made for all dead, live and unbalanced loads, rib shortening, temperature variation, etc.

Badminton Courts Building, New Haven Lawn Club Association
Douglas Orr, Architect

Swarthmore College Field House
Walter T. Karcher and Livingston Smith, Architects



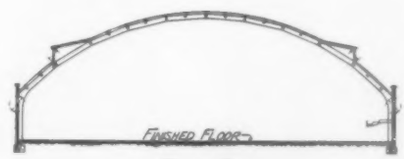
Type A



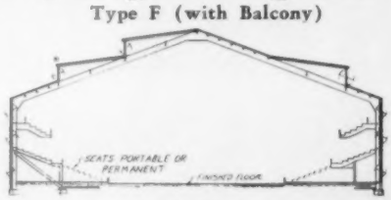
Type F

Type F (with Balcony)

Type G



Type K



Type J

United States Patents

1,480,882 January 15, 1924
1,639,930 August 23, 1927
1,783,958 December 9, 1930
1,795,331 March 10, 1931
1,891,346 December 20, 1932
2,021,480 November 19, 1935
2,031,937 February 25, 1936

TYPES OF ARCH ROOF CONSTRUCTION

for Every Requirement

Other Patents Pending

Canadian Patents

329,165 January 10, 1933
331,206 March 28, 1933

Great Britain Patents

382,138 January 18, 1932

JOHNS-MANVILLE

22 East 40th Street, New York, N. Y.

OFFICES IN ALL LARGE CITIES

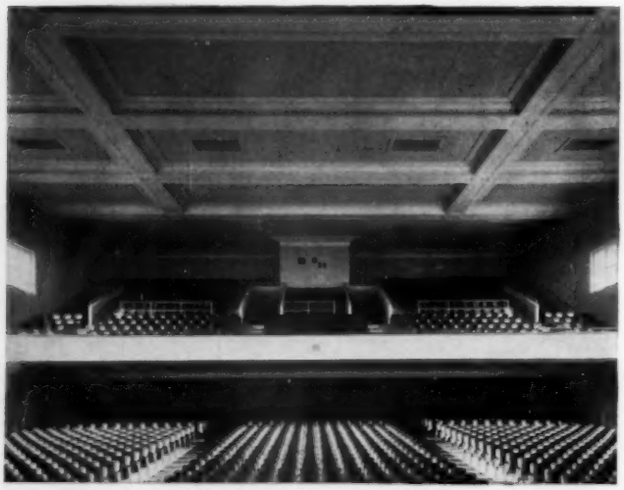
J-M SOUND CONTROL

Sound control is an essential requirement in the modern school or university. Disturbing, nerve-wracking noises—from busy corridors, gymnasiums, swimming pools, cafeterias, kitchens—are no longer a necessary evil. And auditoriums and lecture rooms can be so treated that a speaker's voice can be heard clearly and distinctly in any part of the hall. Johns-Manville offers acoustical treatment and sound control materials for every type of noise problem.

J-M Sanacoustic Tile

J-M Sanacoustic Tile, which has the widest adaptability and is about the most nearly universal sound control material, absorbs 85% of noise. It consists of a perforated sheet metal tile, which serves as a container for a special rock wool pad, the sound absorbing medium.

Fireproof—Easily Maintained: The triple-baked enamel finish of Sanacoustic Tile presents a sanitary, light-reflecting surface that is easily washed and which can be frequently repainted without in any way affecting its efficiency as a noise-quieting material; hence, maintenance is reduced to a minimum. And—a vitally important consideration—J-M Sanacoustic Tile is one of the few acoustical materials that is completely fire-safe. Furthermore, it is inherently permanent, since rock wool is a mineral product, completely immune to rot or decay.



J-M Sanacoustic Tile Applied in the Auditorium of the Clinton Kelly High School, Portland, Oregon

For use in damp or humid places, such as kitchens and swimming pools, the perforated tile and accessories are fabricated of corrosion-resistant metal.

Sanacoustic Tile Can Be Easily Washed; Frequently Repainted

100% Salvageable: Sanacoustic Tile can be quickly and readily applied, and the ease with which the tile units can be removed makes possible the complete salvage of an installation in case of alteration, and facilitates the making of any desired change in lighting outlets.

Neat, Attractive Appearance: J-M Sanacoustic Tile, and other Johns-Manville sound-absorbing materials for application on wall or ceiling, are neat and attractive in appearance, and are available in numerous finishes that offer practically limitless decorative possibilities.

Where Schools Need Sound Control Treatment

For the benefit of students and faculty alike, sound control treatment should be used for the quieting of corridors, classrooms, libraries, gymnasiums, swimming pools, cafeterias and lunchrooms, and executive offices. Acoustical treatment is also needed to assure correct hearing conditions in auditoriums, chapels, assembly rooms and lecture halls.

J-M Sound Isolation

Johns-Manville acoustical service also includes the isolation of undesirable vibrations coming from machinery in various parts of the school, which thus permits the installation of mechanical equipment at advantageous locations without causing disturbance in other parts of the building.

Write for New Brochure

You will be interested in the new Johns-Manville brochure, "Methods of Sound Control for Schools and Universities," AC-16A. It describes the characteristics and uses of all J-M Sound Control Materials, and tells how you may obtain the services of Johns-Manville Acoustical Engineers, without any obligation on your part. The booklet is free on request.

J-M ASPHALT TILE FLOORING

Johns-Manville Asphalt Tile, Type A, a resilient, quiet and attractive flooring material furnished in rectangular tile units of various sizes, is ideally suited for use in the modern school or university. This material provides a permanently smooth and durable surface, in many possible color combinations in either plain or marbleized design.

Quiet—Fire-Resistant—Easily Maintained: The resiliency of this flooring material cushions heels, makes for quiet foot traffic and comfort underfoot. Being fire-resistant, J-M Asphalt Tile Flooring has been officially approved for fireproof buildings in many cities. Barring exceptional abuse, it requires no attention or expense for maintenance beyond ordinary cleaning. It is odorless, waterproof and does not originate dust.

J-M Heavy Duty Asphalt Tile

J-M Heavy Duty Asphalt Tile was designed especially for severe service such as that encountered in school corridors, halls, lobbies, etc. Provided in four attractive solid colors—red, mahogany, brown and black—and in several marbleized designs, it will give more satisfactory service than other resilient floor surfacing where exposed to extremely heavy foot traffic or where damp conditions prevail. From a construction viewpoint, Heavy Duty Tile Flooring has an additional advantage, in that it can be applied directly to smooth wood sub-floors without the usual leveling course.

Details on Request

J-M Asphalt Tile Flooring costs no more than other resilient floorings—in many cases, considerably less. The illustrated J-M Tile Flooring Brochure describes both Type A and Heavy Duty Asphalt Tile. Color charts showing the attractive color combinations and designs are also available. Send for Brochure FL-20 on Asphalt Tile Flooring, and ask for the color charts, sent free on request.

J-M Heavy Duty Tile is unexcelled for service in school corridors

J-M BONDED BUILT-UP ROOFS

Johns-Manville Bonded Asbestos Built-up Roofs answer all requirements for a school roof. They are light-weight, durable, weatherproof—and, a most essential consideration, fireproof. Built-up of alternate

J-M Built-up Roofs are permanent, weatherproof, fire-resistant

layers of asphalt-saturated asbestos felt and roofing asphalt, they cannot burn.

Easily Maintained: Asbestos, being imperishable and rot-proof, provides the best assurance of long roof service. Because asbestos fibres are non-capillary, J-M Asbestos felts form a positive barrier against evaporation of the waterproofing asphalts; they are virtually immune to the intense drying-out action of the sun. Hence a J-M Asbestos Roof remains weatherproof throughout its long life with minimum expense for upkeep. Hundreds of Johns-Manville Built-up Roofs, after more than twenty years of virtually maintenance-free protection against fire, sun and weather, are still in excellent condition.

J-M Roofinsul

J-M Roofinsul was designed primarily for use as insulation under J-M Bonded Asbestos Built-up Roofs. Light in weight, with high insulating value, it is also rigid and structurally strong. This insulation is a decidedly worthwhile investment because of the fuel savings it effects in winter and the comfort it provides in warm weather. Furthermore, by preventing condensation J-M Roofinsul protects the deck against rot or corrosion; and, acting as a resilient cushion between roof deck and felts, it provides protection to the built-up roof by taking up strains due to any movement which may occur in the deck.

Specification Book on Built-Up Roofs

For complete specifications and drawings on all types of Johns-Manville Bonded Built-Up Roofs, ask for Specification Book BU-30-A.

This book also contains a wealth of authoritative data on the entire subject of built-up roofs. It shows why certain roofing materials and methods afford more complete protection from the elements; it goes thoroughly into the flashing problem and many other troublesome roof construction details; and it explains how roof insulation cuts fuel and air conditioning costs and protects roofs from damage caused by expansion and contraction. A free copy of this book may be obtained through any Johns-Manville Office.

THE CELOTEX CORPORATION

919 N. Michigan Avenue
Chicago, Illinois

SOLE DISTRIBUTORS OF

PAINTABLE PERMANENT

ACOUSTI-CELOTEX

Acousti-Celotex is manufactured in two types, Series C and M, described as follows:

SERIES C is a light, rigid tile manufactured of bagasse (the long, tough fibres of sugar cane) combining extraordinary sound absorbing efficiency with a desirable smooth finished surface. The face of each tile is perforated to within ¼" of the back of the tile with 441 holes per square foot —these perforations (patented) are of definite diameter, depth and spacing and act as channels which allow the sound waves ready access to the porous interior of the tile. The patented Ferox Process used on all Celotex Cane Fibre Products, makes the material proof against termites, dry rot and other cellulose destroying organisms.

SERIES M is made of mineral aggregate pressed with a binder to form a rigid, incombustible tile with 676 holes per square foot.

PAINTABILITY—Both types can be frequently painted without decreasing efficiency. Unless otherwise specified, Series C is furnished with standard ivory paint rolled into surface and Series M in a white asbestos paint finish.

CONDUCTIVITY—Series C—.33 B.t.u. per hour, per square foot, per degree F., per inch thickness. Series M—0.35 B.t.u. per hour, per square foot, per degree F., per inch thickness.

MOISTURE RESISTANCE—Integrally waterproofed during manufacture.

VERMIN PROOF—Contains no food for rats, mice or other rodents or vermin.

FIRE RESISTANCE—Series M is rated as incombustible.

IMPACT AND ABRASION—VHR (factory applied varnish, hot rolled into the tile) provides a hard, durable wearing surface.

ERECTION—Acousti-Celotex is easily and rapidly erected with adhesive, nails, clips or suspension systems.

LIGHT REFLECTION—Up to .81 with VHR painted.

SOUND ABSORPTION—Series C—up to .98 at 512 cycles on 1¼" material. Series M—up to .95 at 512 cycles on 1" material.

SIZES—Cane Tile comes in standard 6 x 12, 12 x 12, and 12 x 24 inch sizes. Mineral Tile is manufactured in standard 6 x 12 and 12 x 12 inch sizes. Special sizes in both types of material are available at additional cost.

Acousti-Celotex
Friends School, Classroom, Baltimore, Maryland

ABSORBEX

Absorbex is an acoustical material that furnishes great structural strength as well as excellent acoustical properties. It is a cement-timber product made by a process which shreds timber into long tough fibres and with a binding cement is pressed into slabs of uniform thickness. It is available in three types—A, C and F—depending on the fineness of fibres. Absorbex affords high insulation, fire-resistance and can be painted without materially affecting the initial efficiency.

Since Absorbex is a tough, hard and strong acoustical material, it is especially adaptable to gymnasiums as it withstands ball impacts and other contacts on lower wall areas. Absorbex is also adaptable to auditoriums, corridors and classrooms and can be harmoniously combined with many architectural trends to create pleasing effects.

FIRE RETARDANT TILE FORM

SOUND ABSORPTION—Efficiency up to .98 at 512 cycles.

TYPES AND SIZES—Provide a full range of sound control.

INERT—To temperature and humidity changes under ordinary conditions.

MOISTURE RESISTANCE—Is adequately waterproofed for normal conditions.

VERMIN PROOF—Affords no food value for insects, rodents or vermin.

FIRE RESISTANCE—Is Highly fire resistant.

IMPACT AND ABRASION—A hard, tough and strong material.

LIGHT REFLECTION—Up to .79 when sprayed with white oil-base paint.

LOW MAINTENANCE COST

STERILE

TEXTURE—Interesting and non-mechanical.

SIZES—Type A—furnished in tile form, beveled, 9 x 9, 9 x 18, 18 x 18 and 18 x 36 in., 1 inch thickness only. Larger sizes are available at additional cost. Type C—furnished only in sheets, 20 inch wide by 32, 48 or 64 in. long, 1 in. thickness. Type F—furnished in sheets, 20 in. wide by 32, 48 or 64 in. long, 1, 2 or 3 inch thicknesses.

Absorbex
Yale Univ. (Calhoun College), New Haven, Conn.
Arch.: John Russell Pope

CALICEL PRODUCTS

Calicel, Calistone and Calicel Acoustical Castone possess the characteristics that have made stone the traditional material for finishing monumental interiors, combining this beauty with the softening hush of excellent acoustical treatment.

Calicel Acoustical Products provide unusual possibilities—because of their textures and colors they blend with all types of monumental finishes or can be combined with each other as wall and ceiling finishes to carry out the architecture of the building and add noise correction.

CALICEL TILE aggregate is thoroughly mixed with a mineral binder, moulded with hydraulic presses and cured or dried in kilns.

CALISTONE is Calicel aggregate mixed with Portland cements, moulded with hydraulic presses and cured in kilns under steam pressure . . . has the appearance of stone, and superior abrasive and wearing strength qualifications.

CALICEL ACOUSTICAL CASTONE is ideal for rooms demanding rich ornamentation. It is formed into coffers and elaborate friezes, panels and mouldings with unusually sharp detail.

CALICEL in the natural type is a light buff color in a fine texture . . . Italian Type has a sprinkling of dark colored Calicel particles . . . Tapestry Type resembles the Italian but has a coarser texture. CALISTONE presents no greater limitations than natural stone—texture and color can be matched.

MOISTURE RESISTANCE—Unaffected by moisture under normal conditions.

CONDUCTIVITY—.53 B.t.u. per hour, per sq. ft., per degree F., per inch thickness.

PAINTABILITY—Can be painted or is available with a factory applied finish permitting cleaning by washing.

VERMIN PROOF—Contains no food value for rats, other rodents or vermin.

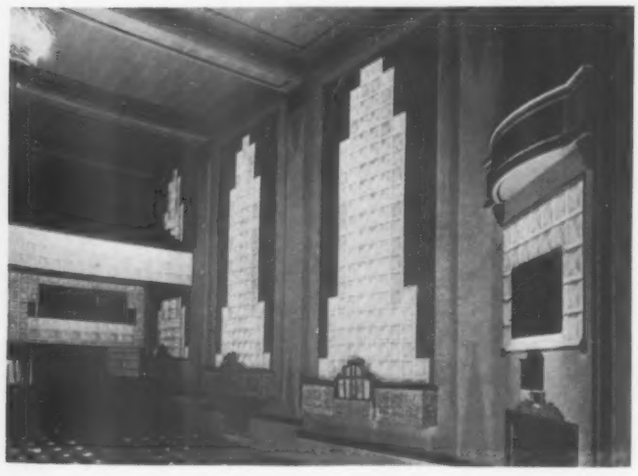
FIRE RESISTANCE—Contains no combustible matter.

SOUND ABSORPTION—Calicel—up to .83 at 512 cycles; Calistone up to .77 at 512 cycles.

SIZES—Calicel Tiles are made ¾ and 1 inch thick and in standard sizes 6 x 12, 12 x 12 and 8 x 16 inches. Special sizes can also be provided. Calistone is made in a minimum thickness of 1", and in sizes and shapes to meet special designs.

Vibrafram
Right: **Palace Theatre Auditorium, Fayetteville, Arkansas**

Calicel
Below: **Roosevelt High School, Des Moines, Iowa**
Arch.: Proudfoot, Rawson, Brooks & Borg.



VIBRAFRAM

Vibrafram, an acoustical tile made of fireproofed felt and pressed into plain or ornamental hollow shapes, is extremely light in weight and easy to apply with proper adhesives. It absorbs sound by diaphragmatic vibration of the tile units. This principle of sound absorption is especially valuable in auditoriums and music rooms. Pleasing decorative effects are possible by the proper design and layout of area to be treated.

SOUND ABSORPTION—Develops high efficiency in low frequency range.

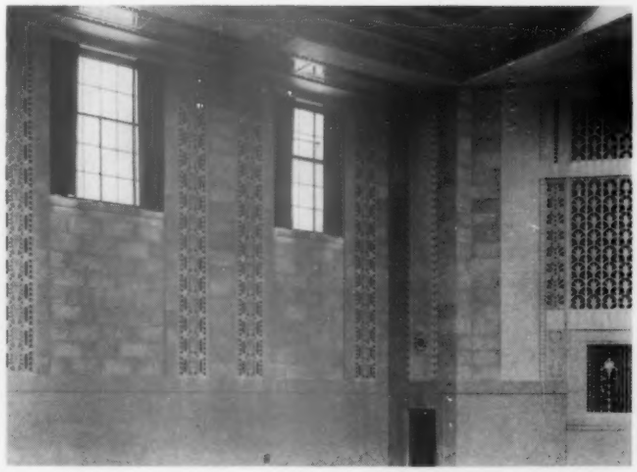
LIGHT WEIGHT—Approximately 3 ounces per square foot.

ERECTION—Easily and rapidly erected.

DECORATION—Many interesting patterns are possible.

FIREPROOFED

SIZES—Furnished in tiles 13 inches square, 1½ to 3 inches deep.



Above:
Rufus King High School Auditorium,
Milwaukee, Wisconsin
Walls treated with plain and ornamental Calistone,
Bedford Stone Type.

THERMAX

TRADE MARK

Reg. U. S. Pat. Off.

Close-up of Thermax Fire-resisting Structural Insulating Slab

PRODUCT

Thermax Fire-resisting Structural Insulation for partitions, furring, floors, ceilings and roofs.

THERMAX PARTITIONS

Thermax partitions are fire, sound and earthquake resistant. They are light in weight, economically erected, and offer a true surface and excellent bonding key for plaster or stucco.

Thermax is also used in connection with reinforced concrete floor construction forming; sound-deadening; plaster base; and for suspended ceiling construction.

Sizes	Weight
1″ x 20″ x 48″, 64″, 96″ 2″ x 20″ x 48″, 64″, 72″, 96″ 3″ x 20″ x 32″, 48″, 64″, 96″	Approx. 2.2 lbs. per sq. ft. per inch thickness Thermal Insulation Value .46 B.t.u. per inch

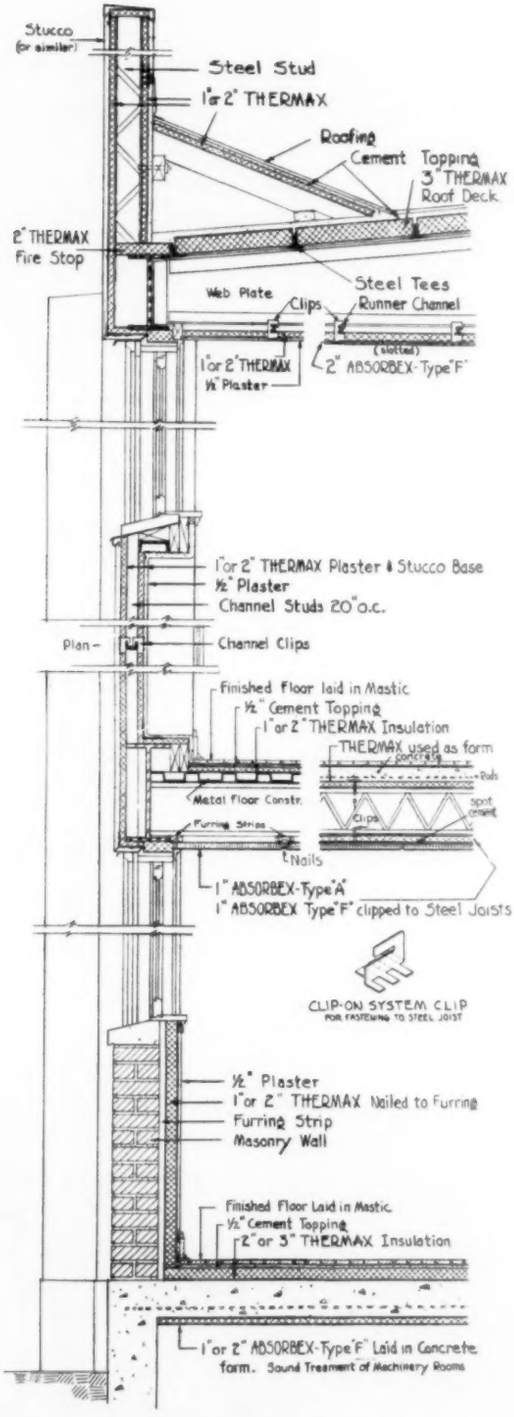
FIREPROOFING — 2″ Thermax plastered partitions have been tested and are classified one hour, incombustible by the Underwriters Laboratories. Thermax is approved for use in Fireproof Building by Building Departments of leading cities in U. S. and Europe.

EARTHQUAKE-RESISTING—Thermax absorbs shock without affecting plaster or stucco facing.

LIGHT WEIGHT—Thermax minimizes the combined weight of adaptable construction.

UNIFORMITY—Rigid factory supervision assures a uniform product.

REASONABLE COST—Fire resistance, structural characteristics and insulation efficiency, combined in one material, make the comparative cost of Thermax low.



COMPOSITE DETAIL
ILLUSTRATING TYPICAL USES OF THERMAX FIREPROOFING INSULATION AND ABSORBEX ACOUSTICAL CORRECTIVE FOR
SCHOOL CONSTRUCTION

THE AMERICAN SCHOOL AND UNIVERSITY

EASE OF ERECTION—Thermax is easily and rapidly erected.

EXPANSION AND CONTRACTION—Installations show no defects due to expansion or contraction under various climatic conditions.

VERMIN PROOF—Fire-resisting cement binder is unattractive to vermin and termites.

FUNGI PROOF—Shows unusual resistance to the attack of fungus or dry rot.

MOISTURE RESISTANCE—Non-capillary.

THERMAL CONDUCTIVITY—.46 B.t.u. per hour, per sq. ft., per degree F., per inch thickness.

SOUND-INSULATION—Thermax plastered partitions are recommended for sound-deadening, sound isolation for machinery rooms, and sound filters and baffles in air conditioning systems.

Thermax Partitions
Fire and Earthquake Resistant

STRUCTURAL STRENGTH—Thermax satisfies requirements for insulated load-bearing roof decks and floors; fire-resisting, non-bearing partitions; sheathing and plaster and stucco base.

CELOTEX
REG. U.S. PAT. OFF.
TEXBORD
Trade Mark

Now you can enjoy the dignity and mellow beauty of decorative walls in offices, reception rooms and corridors at a fraction of their usual cost—with Celotex Texbord.

This new product is manufactured of the finest genuine cabinet wood veneer—adhered to a ¼ inch Celotex backing—this strong backing facilitates its application direct to old plastered walls without mending the cracks, and is flexible enough to permit bending over arches and moderate curves.

Texbord planks have beveled edges and shiplapped joints. All nail heads are concealed and no batten strips are necessary. When refinishing old walls it is installed without removing baseboards, mouldings, or window casings.

Texbord is available in Walnut, Mahogany and Avodire in 8 and 10 foot planks—6, 9 or 12 inches wide. Each plank is prefinished at the factory including filling, staining and waxing to assure a beautiful lustre that makes further treatment unnecessary.

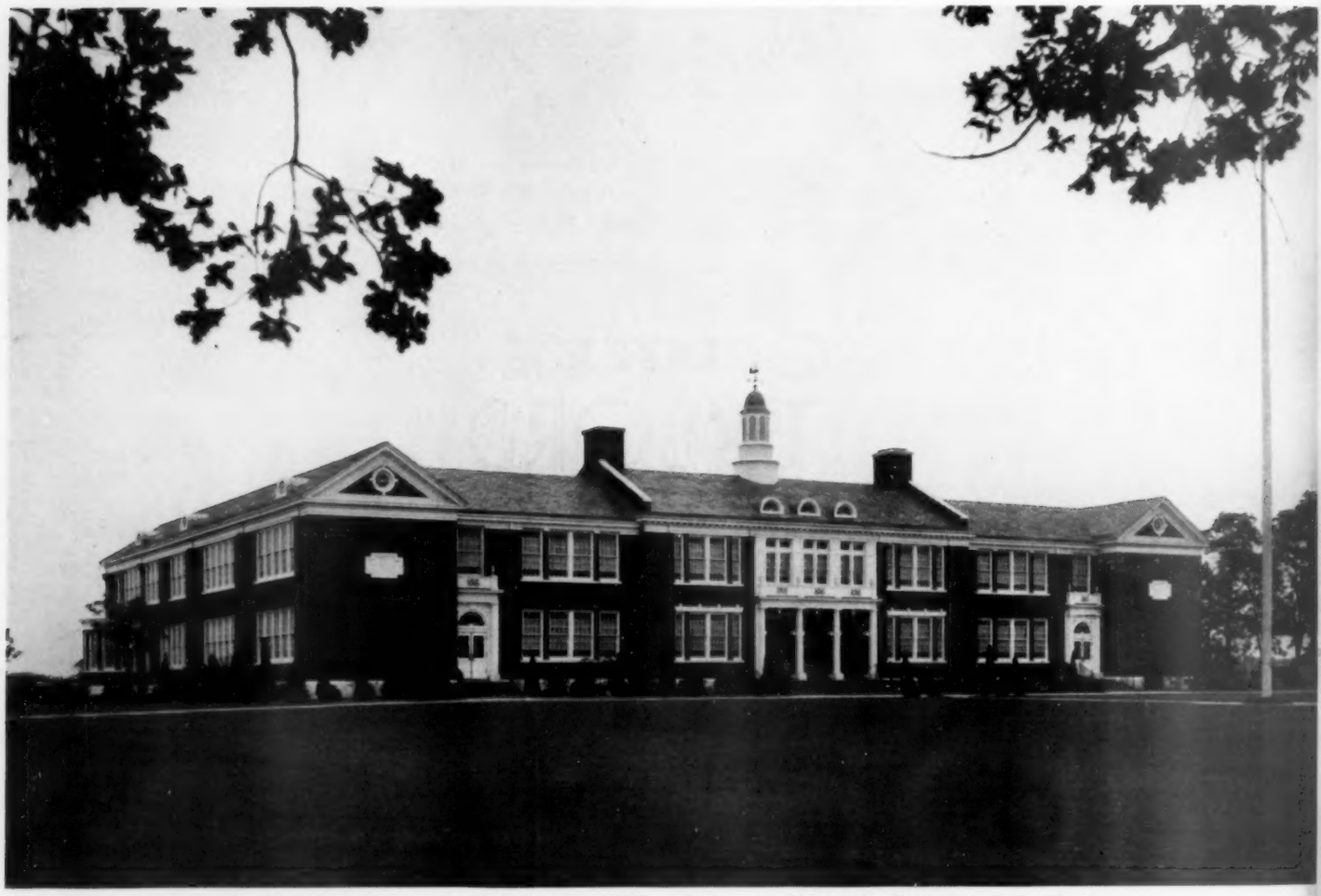
Application of Texbord

Texbord Installation

THE TILE-TEX COMPANY

Plant and General Office Chicago Heights, Illinois

EASTERN SALES OFFICE—101 Park Avenue, New York City



Grade School, Mattituck, L. I., N. Y.—William LaFon, Architect, Southampton, L. I., N. Y.

TILE-TEX—THE STANDARD ASPHALT TILE FLOOR FOR SCHOOLS

For the past thirteen years, millions of square feet of Tile-Tex have been installed in school houses throughout the United States. These floors are giving uniformly good service, represent on the average a low investment cost per square foot, and are maintained simply and economically. They represent what we honestly believe to be the greatest value in floors for schools that can be purchased today.

Tile-Tex is designed and manufactured to meet the demand for a low cost flooring that will withstand heavy foot traffic under exacting conditions over a long period of years. Prominent school architects specify it consistently and know that the Company manufacturing it can be relied on to stand behind the material and improve it year after year. Hundreds of Tile-Tex school house floors throughout the country are mute testimony to the quality of the product and the knowledge and skill of the Tile-Tex distributors who install it.

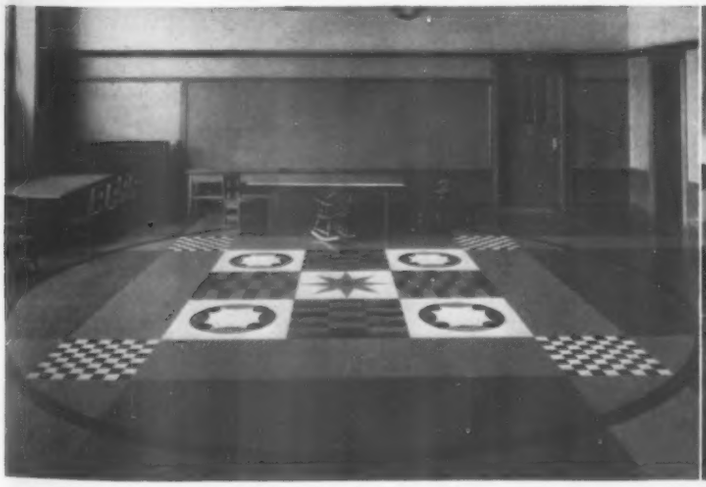
TILE-TEX MEETS THE REQUIREMENTS OF EVERY SCHOOL AREA!

1. ENTRANCE LOBBIES—Striking design possibilities, long-wearing, and non-slip.
2. CORRIDORS—Safe, attractive, easy to maintain, quiet, durable, and economical.
3. CLASSROOMS—Long-wearing, non-distracting to the pupil, easy to keep clean, and suitable for either fixed or movable seating equipment.
4. TOILETS and RESTROOMS—Acid resistant, sanitary, permanent, and easy to clean.
5. AUDITORIUMS—Flexible in design, adapted for ramps and inclines, easy to clean, and durable.
6. LABORATORIES—Acid and alkali resistant, comfortable to stand and walk on, and easy to clean.
7. LIBRARIES — Quiet, comfortable, attractive, and easy to clean.
8. KINDERGARTENS—Safe for children to play on, quiet, adapted to special inserts and game designs, sanitary, and easy to clean.
9. CAFETERIAS and LUNCHROOMS—Easy and inexpensive to maintain, good-looking, long-wearing, and, where necessary, available in Greaseproof colors.
10. OFFICES—Good appearance, durable, quiet, and easy to keep clean.

Tile-Tex is available in four distinct color lines—Economy, Standard, DeLuxe, and Greaseproof—all of the same high quality. The judicious selection of colors to meet the specific requirements of each school area is possible because of these carefully designed color groups. Fifteen sizes and three thicknesses give added flexibility to both design and construction problems.

Laboratory—Cornell Medical College
New York, N. Y.

Office—Southampton Grade School
Southampton, N. Y.



Kindergarten—Monroe School
Monroe, Connecticut

Library—Southampton Grade School
Southampton, N. Y.

Lobby—Riverhead High School
Riverhead, N. Y.

Corridor—St. Mary College & Academy
Monroe, Michigan

Classroom—Riverhead High School
Riverhead, N. Y.

Cafeteria—Harvard University
Cambridge, Massachusetts

PARTIAL LIST OF TILE-TEX SCHOOL INSTALLATIONS

Southampton Grade School, Southampton, Long Island (35,000 ft.)
Wm. LaFon, Architect, Southampton, Long Island
Las Vegas High School, Las Vegas, Nevada (38,000 ft.)
Geo. A. Ferris & Son, Architects, Reno, Nevada
St. Mary College and Academy, Monroe, Michigan (300,000 ft.)
D. A. Bohlen & Son, Architects, Indianapolis, Indiana
Northwestern University, Evanston, Illinois (40,000 ft.)
Belchertown State School, Belchertown, Massachusetts (6,200 ft.)
Kendall, Taylor & Company, Architects, Boston, Massachusetts
University of Mississippi, Oxford, Mississippi
Frank P. Gates Co., Architects, Jackson, Mississippi
Cornell Medical College, New York, N. Y. (110,000 ft.)
Coolidge, Shepley, Bulfinch & Abbott, Architects, Boston, Massachusetts
Berry Schools, Rome, Georgia (30,000 ft.)
University of Wisconsin, Madison, Wisconsin
Arthur Peabody, Architect, Madison, Wisconsin
Clifford B. Connelly School, Pittsburgh, Pennsylvania (50,000 ft.)
Edward B. Lee, Architect, Pittsburgh, Pennsylvania
Louisiana State University, New Orleans, Louisiana (43,000 ft.)
Weis, Dreyfous & Seiferth, Architects, New Orleans, Louisiana
Riverhead High School, Riverhead, Long Island (52,000 ft.)
Wm. LaFon, Architect, Southampton, Long Island
Terrell School, Fort Worth, Texas (22,000 ft.)
Phillips Exeter Academy, Exeter, New Hampshire (20,500 ft.)
Cram & Ferguson, Architects, Boston, Massachusetts
Junior High School, Sidney, Ohio (13,090 sq. ft.)
Loudenbach, Greytag & Loudenbach, Architects, Sidney, Ohio
Matteson High School, Matteson, Illinois (3,000 ft.)
Wainwright & Vaughn, Architects, Hammond, Indiana
Washington State Normal School, Ellensburg, Washington
J. W. Maloney, Architect, Yakima, Washington
New York University, New York, N. Y.
Augustus N. Allen, Architect, New York, N. Y.
Junior High School, Benton Harbor, Michigan (15,200 ft.)
Warren Holmes Company, Architects, Lansing, Michigan
Grade School, Old Lyme, Connecticut (15,000 ft.)
Ernest Sibley, Architect, Litchfield, Connecticut
University of Idaho, Southern Branch, Pocatello, Idaho (20,500 ft.)
Wyandotte County High School, Bethel, Kansas (11,800 ft.)
Peterson & Almon, Architects, Kansas City, Missouri
University of Alabama, Union Building, Tuscaloosa, Alabama (35,000 ft.)
Miller & Martin, Architects, Birmingham, Alabama
Washington Irving School, New York, N. Y. (32,000 ft.)
Board of Education Architect
University of Florida, Gainesville, Florida
Rudolph Weaver, Architect, Gainesville, Florida
Swanton School, Swanton, Ohio
Langdon, Hohly & Gram, Architects, Toledo, Ohio
Ethel Walker School for Girls, Simsbury, Connecticut (45,000 ft.)
St. Vincent DePaul School, Mt. Vernon, Ohio (14,800 ft.)
Glass & Ramsey, Architects, Columbus, Ohio
Calvin College, Grand Rapids, Michigan (10,800 ft.)
Robinson & Campeau, Architects, Grand Rapids, Michigan
Georgetown University Dormitory, Georgetown, D. C. (61,600 ft.)
Emil G. Perrot, Architect, Philadelphia, Pennsylvania
Concordia College, St. Paul, Minnesota (9,850 ft.)
Long & Thorshov, Architects, Minneapolis, Minnesota
Kent State Normal School, Kent, Ohio (15,700 ft.)
T. Ralph Ridley, State Architect, Columbus, Ohio
Morton Grade School, Hastings, Nebraska (29,200 ft.)
M. L. Evans, Architect, Hastings, Nebraska
Harrison Avenue Grade School, Mamaroneck, N. Y. (22,500 ft.)
District School No. 69, Watseka, Illinois (3,000 ft.)
North Junior High School, Joplin, Missouri (12,400 ft.)
T. W. Williamson, Architect, Topeka, Kansas
Brookville School, Brookville, Indiana (12,400 ft.)
Henkel & Hansen, Architects, Connersville, Indiana
University of Tennessee, Memphis, Tennessee
Jones & Furbringer, Architects, Memphis, Tennessee
Bell Skinner Musical Building, Vassar College, Poughkeepsie, N. Y. (3,000 ft.)
Allen, Collens & Willis, Architects, Boston, Massachusetts
Danvers High School, Danvers, Massachusetts (23,500 ft.)
Chas. G. Loring, Architect, Boston, Massachusetts

TILE-TEX WALL TILE—A NEW, LOW-COST WALL TILING—IDEAL FOR CORRIDOR WAINSCOTING

COLORS

A wide range of color, from light pastel shades to rich dark hues, is available.

Practically any decorative scheme is possible. Send for "Decorative Walls by Tile-Tex" which includes complete color charts.

An attractive corridor wainscot of Tile-Tex Wall Tiling

SIZES

Fourteen sizes, from small to large, make possible wall treatments heretofore not attainable with other wall materials.

Sizes are 3x3, 3x6, 4x4, 4½x4½, 4x12, 6x6, 6x12, 6x18, 9x9, 9x18, 9x27, 12x12, 12x24, and 18x24.

Now it is possible for schools to wainscot their corridors with an economical, durable, and attractive tiling which can be applied over existing plaster walls in present buildings, or over smooth plaster backing in new construction.

Toilets, restrooms, and cafeterias are other areas where this new, unique wall surfacing can be used to advantage. It's easily and quickly erected—it can be had in almost any color scheme in both plain and mottled colors—and it's simple and inexpensive to clean.

The cost of Tile-Tex wall tiling applied is considerably less than conventional ceramic tile. If alteration or damage necessitates repairs, it is possible to do so quickly and inexpensively with Tile-Tex wall tiling without muss or fuss. Installation is made by skilled wall covering contractors located throughout the principal cities and towns of the country.

THE TILE-TEX COMPANY
CHICAGO HEIGHTS, ILL.

CONGOLEUM-NAIRN INC.

General Office: Kearny, New Jersey

SEALEX
Trademark Registered
LINOLEUM FLOORS *and*
WALL LINOLEUM

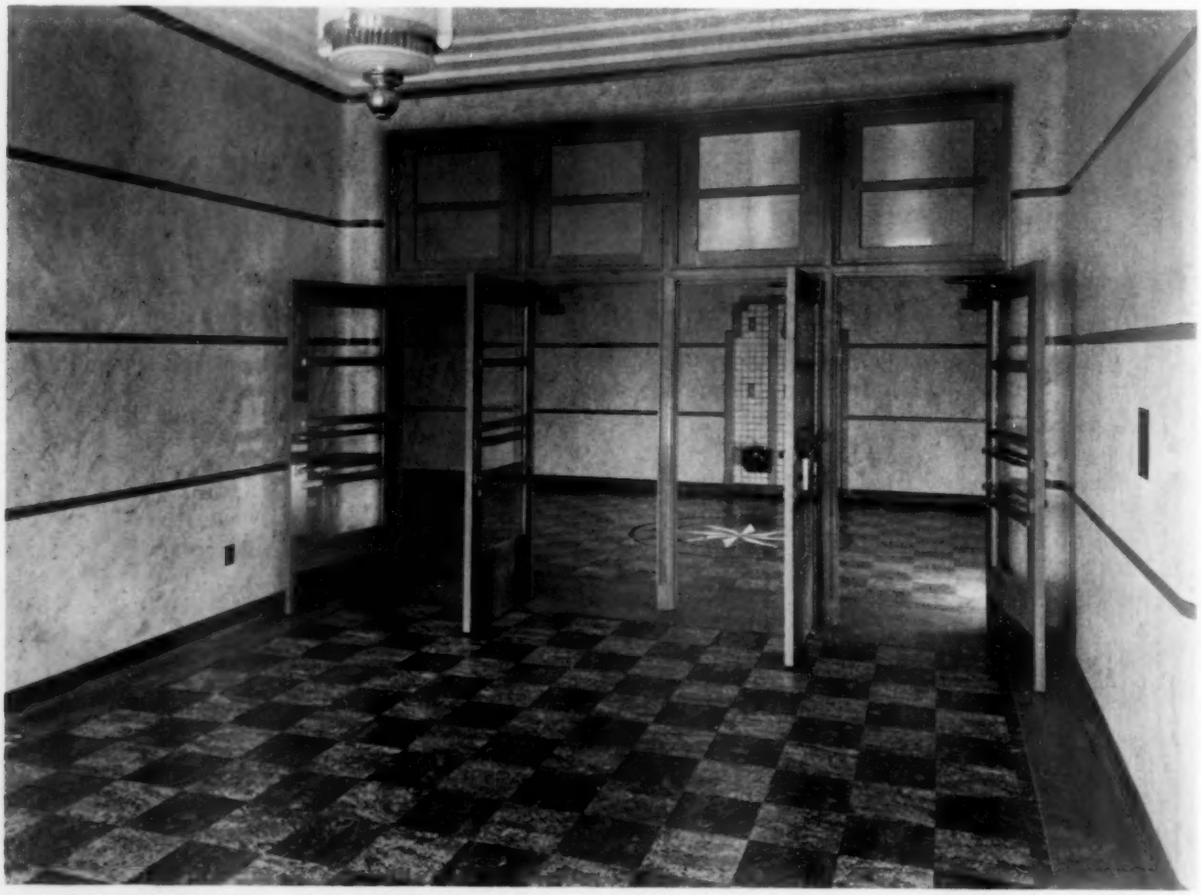
Thousands of schools, including many of America's best known colleges and universities, have installed Sealex Linoleum Floors. Manufactured by Congoleum-Nairn, world's largest producer of smooth-surface floor-covering, Sealex Linoleum possesses certain unique advantages that make it a first choice in the school field.

Sealex Linoleum is resilient; therefore quiet and comfortable underfoot.

It is also a highly sanitary and easy-to-clean flooring. For its smooth surface contains no dirt-catching and dust-generating cracks or joints.

Furthermore, Sealex Linoleum is built to withstand many years of wear without expensive refinishing. To these qualities is due the steadily increasing popularity of Sealex for school floors.

There are Sealex Floors appropriate for every type of school interior. And any floor design, ranging from colorful insets for younger pupils' classrooms to classic or school emblems fitting for the finest university, may be cut to order at moderate cost in Sealex Linoleum.



In Leal Grade School, Urbana, Ill., Sealex Wall Linoleum to ceiling height provides a permanently beautiful, sanitary surface. Curved corners make cleaning remarkably easy. Note the distinctive custom-cut inset in the Sealex Linoleum Floor

This resilient, noise-subduing floor in the library of Ponca City, Oklahoma, is Sealex Treadlite Tile, in an individual design created by Architect G. J. Cannon

Without seams or joints in its smooth surface, this floor of Sealex Battleship Linoleum assures the cleanliness and freedom from dust necessary in school areas

Another material highly recommended for school use is Sealex Wall Linoleum. It offers a wide variety of colorings, is washable and sanitary, and never has to be renewed.

Sealex Floors and Walls are equally suitable for remodeling or for completing new school interiors. When installed by authorized contractors who are located in all principal cities, both materials and workmanship are backed by Guaranty Bonds.

SCHOOL SUPERINTENDENTS — Write for our newest "Resilient Floors" catalog. This complete up-to-date catalog of information about floors of the linoleum or cork composition type will be sent without charge to you.

●

CONGOLEUM-NAIRN INC.

KEARNY, NEW JERSEY

The ideal gymnasium floor—splinter-proof, germ-free Sealex Linoleum with inlaid game markers. West Milwaukee High School, Wis.

SLOANE-BLABON CORPORATION

W. & J. SLOANE, SELLING AGENTS DIVISION

295 Fifth Avenue, New York, N. Y.

FLOORING PRODUCTS FOR EVERY PURPOSE

MARBLETONE INLAID LINOLEUM
EMBOSSED INLAID LINOLEUM
STRAIGHTLINE INLAID LINOLEUM
FEATURE STRIP INLAID BORDERS
BATTLESHIP, PLAIN AND JASPE LINOLEUM
CUSTOMBILT LINOLEUM TILE
CORK CARPET

Principal reasons why Sloane-Blabon Linoleum, Custombilt Linoleum Tile, and Cork Carpet rank high in school and college popularity include: (1) attractive range of modern colors and patterns; (2) wide range of service weights to withstand heavy or moderate foot traffic; (3) low initial cost and low maintenance cost; (4) easy to clean and keep clean; (5) sanitary, sound-absorbing, insulating, and non-slippery.

Only the finest of raw materials—cork, wood-flour, color pigments, burlap, and resin—are used in Sloane-Blabon products. That is why their quality exceeds U. S. Government specifications. Where special floor designs are desired, you have your pick of many patterns specially created for school and college purposes; you also have your choice of elaborate inset figures and feature strip borders, made up to your own specifications if you wish.

Feel free to call upon our School Service Department for any information and assistance. We can help you choose the most attractive, practical, and economical types of Sloane-Blabon Floors for every institutional purpose. We can also help you select a reliable contractor in your community whose experience can cope with your most difficult problems. There is no obligation for any of these services.

6,000 square yards of Sloane-Blabon Linoleum protect floors of new McClatchy Senior H. S., Sacramento, Cal. Above, left, lobby reveals panel effect of 3/16″ Sand Jaspe, divided by strips of heavy granite gray Marbletone Inlaid; circle inset combines Marbletone Inlaid, Azure Blue, Clear White, Terra Cotta, and

Ocean Green Plain Linoleum depicting building plan of school. Above, corridor shows 3/16″ Sand Jaspe with Clear White Feature Strips, Plain Brown Borders. Credit for artistic effect is due Starks & Flanders, architects; H. W. Rivett Co., contractor. This installation shows what good taste can achieve

TYPICAL SLOANE-BLABON SCHOOL INSTALLATIONS

SANITATION is one good reason why dirt-resisting Sloane-Blabon Linoleum has been chosen by the College of Dentistry, New York University, New York City, typifying cleanliness

VERSATILITY of Sloane-Blabon Linoleum comes to light at Yale University, New Haven, Conn., where 18,000 sq. yds. are colorfully installed in Sterling Law School and Yale Theatre

MODERN COMFORT is emphasized for future housewives at Bride's School, New York City, with kitchen-utensil insets in Sloane-Blabon Linoleum Floor offering appropriate atmosphere

UTILITY as well as beauty are served for any floor area in school or college with the help of quiet, easy-to-clean, non-slippery Sloane-Blabon Linoleum. It is ideal for modern cafeterias

INDIVIDUALITY of design is easily, quickly achieved when special inset figures are fashioned into the whole Sloane-Blabon Linoleum Floor; feature strips and borders contribute, as well

DURABILITY and smartness become school chums when Sloane-Blabon is allowed to suggest the floor treatment; see here how the quality linoleum handles the prep school decorative problem

SLOANE-BLABON CORPORATION · W. & J. Sloane, Selling Agents Division · 295 FIFTH AVE., NEW YORK, N. Y.

CORK INSULATION COMPANY, INC.

155 East 44th Street, New York, N. Y.

FACTORY: Wilmington, Delaware

BRANCHES

Boston, Mass.
*Chicago, Ill.
Los Angeles, Calif.
Philadelphia, Pa.
San Francisco, Calif.
Seattle, Wash.
St. Louis, Mo.
Washington, D. C.

* Represented by Corinco Insulation Co., Inc.

CORINCO CORK TILE

CORINCO CORK TILE is made of pure raw cork especially selected for the purpose of being made into tile of extremely high quality standards. It contains no shavings, salvaged material nor any by-product of any nature whatever. The cork is carefully shredded to the proper size and shape, which based on our experience of many years, is best suited for the manufacture of abrasion resisting, resilient cork tile. Completely eliminated are dust, sawdust, finely screened granules, as well as foreign matter such as binder or filler. The tremendous pressure exerted upon the cork granules insures a high degree of density—so important to long wear—and the natural resinous saps act as the binder.

A new plant in Wilmington, Delaware, equipped with the latest modern machinery, manufactures Corinco Cork Tile under the same process as used in Algeciras, Spain. Approximately 30 to 40% more cork is used in the manufacture of Corinco Cork Tile than in any other tile now being manufactured in this country.

SHADES

Corinco Cork Tile may be obtained in three shades—light brown, medium brown, and dark. Due to the absence of all foreign matter, the color variations within the various shade groups add considerably to the beauty of the tile and causes the different degrees of brown to enhance and blend with almost any color scheme called for. Light and medium shades are recommended for the field. Dark is suggested for decoration only.

THICKNESSES

Corinco Cork Tile can be made in any thickness up to 1½". Standard thicknesses for flooring and wainscoting are ¼", 5/16", and ½". For stair treads 1" and 1½". Intermediate thicknesses may be had on special orders whenever required.

SIZES

The base size of Corinco Cork Tile is 18" x 36" from which the tile is cut. Any square or rectangular size containing 36 or more square inches will be cut without extra charge. A slight cutting charge becomes necessary when tile sizes contain less than 36 square inches each or for odd or irregular shapes. Plans may be easily worked out so as to cut the tile without waste from the base size of 18" x 36", thus avoiding charge for waste material.

FINISH

The high density of Corinco Cork Tile has made possible the development of a special finish called Corinco Permanent Finish. It is in the nature of a lacquer product which is both flexible and abrasion resistant. It is quick drying, easy flowing an dimproves with age, taking on a semi-burnished finish after being in actual use for a few weeks. It is oil proof, grease proof, water proof and is resistant to sea water. It offers extreme wearing qualities and if after extended use signs of wear appear in the most heavily trafficked spots, the finish may again be applied to cover these spots without removing any of the old finish and without leaving visible marks of overlap. Corinco Permanent Finish has done away completely with the continuous and expensive servicing of floors such as waxing, etc.

PATTERNS

Corinco Cork Tile can be easily worked into any desired pattern such as parqueting, marquetry, etc.

ADVANTAGES

Corinco Cork Tile is economical due to its moderate initial cost. It is long wearing and highly abrasion resistant. It may be cleaned with cold water and if necessary, mild alkali soaps may be used. No other attention is necessary for periods of a year or more, depending on traffic. Corinco Cork Tile flooring is non-skid, resilient and practically noiseless. Rugs will not slide. This flooring therefore is ideal for use in schools, nurseries, hospitals, institutions, public buildings and residences; in fact for any ordinary floor installation.

CORINCO CORK WAINSCOTING

This product is manufactured under the same process as Corinco Cork Tile; in the same thicknesses and the same sizes. It may be obtained either plain or with beveled edges and can be sanded down to a smooth beautiful surface. Application of Corinco Permanent Finish is optional.

CORINCO CORK COVED BASE

Corinco Cork Coved Base is unique in that it is manufactured in one piece as high as 3¾". This eliminates, when used in conjunction with Corinco Cork Tile Flooring, cementing together and all crevices in which dirt may collect or through which water may seep. Takes finish same as the floor.

CORINCO CORK STAIR TREADS AND NOSINGS

These may be furnished to match Corinco Cork Tile Flooring in either 1" or 1½" thickness. Size 12" x 36". Where wood or other treads are already installed, a one-piece cork tile tread any desired thickness and nosing may be had for use in conjunction with cork tile risers, thus creating a soft, resilient, noiseless stairway which eliminates the necessity for carpets or stair pads.

CORINCO ACOUSTICATOR

Corinco Acousticator is a highly scientifically developed acoustical material which results in a material that does not only blanket or muffle the noise that is being controlled, but actually absorbs it. It is manufactured by the oven dry process only, of carefully selected cork granules selected both as to quality, material and size of granules. It can be had in the standard 1½" thickness and in sizes up to 12" x 36". Where it is desired to use a 12" x 24" or a 12" x 36" acousticator—and bevelling is required—this can be accomplished by inserting one or two false bevels in the center, thereby giving the appearance of 3 twelve by twelve acousticators but in one piece, thereby saving in installation costs. These false bevels can also be spaced, when desired, so as to create almost any design required on the ceiling or walls such as Normandy, etc.

OTHER PRODUCTS

Insulation Corkboard for refrigerator boxes, mortuary boxes, cold storage, etc. Cork Pipe Covering for insulation of brine, ammonia, and ice water lines. Isolation Corkboard for elimination of noise caused by physical or direct transmission and vibration.

SERVICISED PRODUCTS CORPORATION

Manufacturers and Distributors

MAIN FACTORY — Chicago

6051 West 65th St., Chicago, Ill.

BRANCHES IN PRINCIPAL CITIES

WHEN you are considering materials for school construction, remember that Servicised Quality products are giving exceptional service in this field. Continuous development of better products has won for **"Servicised"** leadership in the application of plastic, elastic and waterproofing materials to better building.

SERVICISED PRODUCTS FOR SCHOOLS

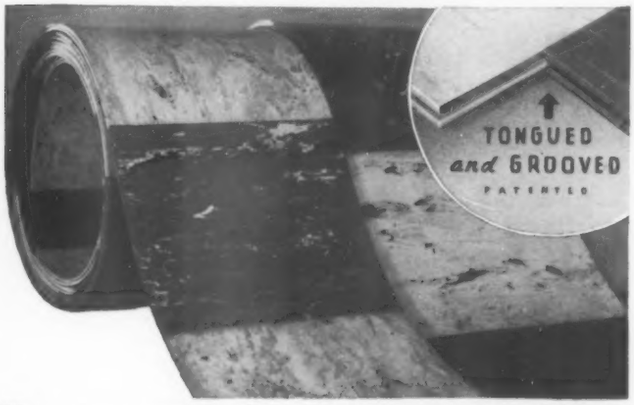
Asphalt Expansion Joints
Cork Expansion Joints
Cork-Rubber Expansion Joints
Sponge-Rubber Expansion Joints
Asphalt Plank Flooring—Plain, Rock-Surfaced and Armored
Asphalt Roof Decking
Syra-Bord Interlocking Rubber Flooring
Cork-Rubber Tile
Rubber Tile Flagging
Safety Stair Treads
Waterproofing Materials
Asphalt Floor Tile

SYRA-BORD RUBBER FLOORING

SYRA-BORD Rubber Flooring is making architectural history. It has revolutionized all previous standards of laying and maintaining rubber floors. Syra-Bord gives color and comfort and cuts cost of installation.

It makes a beautiful, resilient floor which cannot warp, curl, creep nor crack—and can be easily laid by any handy man at one-quarter the cost of installing single tile.

Syra-Bord Rubber Flooring is made in 10 ft. strips which can be laid to make an impervious floor in one-quarter the time required to lay individual tiles



The accurate tongue-and-groove joint shown in upper right corner ensures a perfect-fitting floor covering

The unique feature of Syra-Bord is that it comes in 10-foot slabs, tongued and grooved on sides and ends for tight and interlocked matching. The pattern blocks are held together by a flexible stock which acts as an expansion joint between blocks. It cannot be laid wrong since it fits together so easily and accurately. Syra-Bord is not merely a floor covering but a floor in itself.

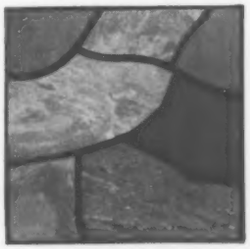
A variety of non-fading colors and a wide range of patterns, both mottled and solid, are available. Slabs are furnished in 6", 9", and 12" widths, 10 feet long and 3/16" or 1/4" thick.

Syra-Bord is recommended as economical and pleasing for any public room. We shall be glad to send you a special detailed folder and color chart on Syra-Bord, the rubber flooring innovation.

RUBBER FLAGSTONE TILE

Brilliant in appearance, pleasing in design and color combinations, Servicised Rubber and Cork Rubber Flagstone Tile is rapidly coming into vogue for service floors which must be durable as well as attractive.

This flagging is usually laid in lobbies, reception rooms and entrance halls but it is equally adaptable to any floor space in the building. It has a distinctive and "livable" personality all its own and, in addition, provides a durable, easily-cleaned floor which is restful under-foot.



Rubber Flagstone Tile

SERVICISED RUBBER SAFETY TREAD

This is a recently developed Servicised product, far in advance of similar treads available at retail stores. It is a carefully moulded and cured product, made of finest pure para rubber. Easily installed, these treads give long and reliable service without cracking or peeling, and with high resistance to abrasion, oil, acids and moisture.

A real quality rubber stair tread that will stand the "gaff"

CORK-RUBBER TILE

Over a period of three years, Servicised engineers have checked up on Servicised Cork-Rubber Tile, both in actual service and in the laboratories. Their findings are conclusive: this new Servicised product meets all requirements for an ideal, silencing, resilient flooring material.

Its advantages: (1) High dirt resistance; (2) Flexible, conforming to minor variations of base without breakage; (3) Resists indentations and scratches; (4) Impervious to air, water and acids; (5) Light, yet very strong; (6) Lasting Beauty.

Cork-Rubber Type Flagstone Tile

Servicised Cork-Rubber Tile is a great improvement over cork flooring with a resin binder. It will give better service and deserves consideration for vestibules, corridors, gymnasium floors, libraries, infirmaries, etc.

Detailed Bulletins on these specialized flooring products will be furnished promptly at your request.

Use SERVICISED materials for tile installation work. SERVICISED underlayment to cover wood floors unsuited to saturated felt. SERVICISED asphalt primer or binder for smoothing uneven and rough concrete.

SERVICISED ASPHALT PLANKING FOR SCHOOL CONSTRUCTION

Asphalt planking is rapidly replacing other materials, such as wood, concrete and poured floorings in School construction. It is more resilient, silent, easier to keep sanitary and lasts longer than other types of floors, especially those surfaces subjected to constant heavy wear. As leading producers of preformed asphalt joints and allied products for more than seventeen years, Servicised can assure you that this Asphalt Planking is of topmost quality.

SCHOOL USES OF ASPHALT PLANKING

Stair Treads
Walkways
Corridors
Roof Decks
Waterproof Protection Course
Ramps
Siding
Engine Room Floors
Refrigeration Insulation
Loading Platforms

Servicised Asphalt Planking is made in three practical types, Plain for ordinary use, Rock-Surfaced, for heavy-duty, non-slip use, and Steel Armored for exceptionally heavy duty.

The planking is extruded, in convenient sizes, under extreme pressure, from acid-resisting, waterproof asphaltic material. It is worked as easily as wood planking but outlasts wood by many years, preserving a smooth and almost indestructible surface. It also outlasts concrete and will not spall nor chip.

Fibres of felt and asbestos incorporated in the bituminous material give stability while a special mineral filler adds toughness and resistance to wear. Tested for more than ten years in tough service on bridge surfacing and heavy trucking traffic lanes, it has decisively proved its merit as a planking which combines durability, lightness and safety.

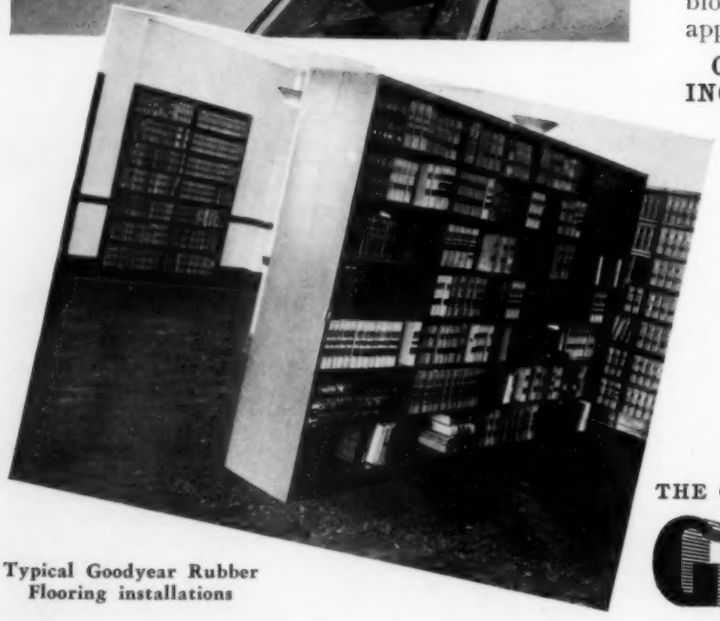
THE GOODYEAR TIRE & RUBBER COMPANY, INC.

Akron, Ohio · · Los Angeles, Calif.

In building or remodeling, specify

GOODYEAR RUBBER
for FLOORS *and* WALLS

to gain these 6 lasting advantages



Typical Goodyear Rubber Flooring installations

1. **DURABILITY**—makes a "lifetime" floor that will probably never need replacing.
2. **CLEANLINESS**—impervious to dirt. Easy to clean and to keep clean.
3. **QUIET**—its resiliency assures maximum silence, as well as comfort, underfoot.
4. **BEAUTY**—rich two and three tone colors that permanently retain their life and sparkle.
5. **FIRE- AND STAIN-RESISTANT**—unmarred by lighted cigarettes and matches; not permanently stained by most acids, alkalis, ink, etc. Ideal for laboratories.
6. **STYLE**—wide choice of colors and designs, adaptable to any interior plan.

TWO TYPES AVAILABLE

GOODYEAR RUBBER TILE—laid in individual blocks of specified thickness, size, shape and color—applied piece by piece in any desired pattern.

GOODYEAR WINGFOOT RUBBER FLOORING—made in continuous lengths. The most economical, ***permanent*** covering for large schoolroom floors. Available in a wide range of colors.

GOODYEAR WINGFOOT WALL RUBBER—this newest product of "the greatest name in rubber" provides, for wall spaces, the same advantages that distinguish floor areas covered with Goodyear Rubber Flooring.

For complete specifications, see Sweet's Architectural Catalogue

THE GREATEST NAME IN RUBBER

GOODYEAR

WRIGHT RUBBER PRODUCTS CO.

P. O. Box 696, Racine, Wisconsin

1922 SIXTEEN 1938 YEARS

OF

Manufacturing Quality Rubber Tile Floors

CHICAGO WHOLESALE OFFICE—13113 Merchandise Mart

Cyrus Northrup Memorial Auditorium Building, University of Minnesota, Minneapolis

REPRESENTATIVE INSTALLATIONS

Lane Technical High School, Chicago
Girls' Industrial School, Oregon, Wis.
Downer College Library, Milwaukee, Wis.
University of Illinois, Urbana
Racine Vocational School, Racine, Wis.
Antioch College, Yellow Springs, Ohio
DePaul University Library, Chicago
State University, Iowa City, Iowa
Baylor University Library, Waco, Texas
State Teachers College, Superior, Wis.
Wassaic State School, Wassaic, N. Y.
C. E. Byrd High School, Shreveport, La.
Capitol Hill H. S., Oklahoma City, Okla.
Washington University, St. Louis, Mo.
Jefferson Elementary School, Menasha, Wis.
St. Sabina Community Center, Chicago
State College, Brookings, S. D.
Norwalk High School, Norwalk, Conn.

The WRIGHT Floor

is ideal for the class room, library, office or corridor in grade and high schools, colleges and universities. The interesting animal inserts available make the floors particularly attractive to kindergarten and primary ages.

The following characteristics of Wright Rubber Tile floors are important factors to be considered when selecting floors for school purposes.

QUIETNESS

The din of hundreds of hurrying feet on hard floors is extremely nerve racking. The Wright floor is quiet under foot and comfortable to walk upon.

BEAUTY

The variety of colors makes it easy to create attractive and practical floors to suit style of architecture and interior decorating schemes.

DURABILITY AND MAINTENANCE

Two important features in any floor. Repeat business from state institutions over a period of years proves the wearing quality of Wright floors. Closely connected with the satisfaction Wright floors give is the ease and economy with which they are maintained.

COST

Last but not least, Wright Rubber Floors compare favorably in cost with the heavier grades of linoleum.

Write us for detailed information and samples.

Architectural specifications in Sweet's Catalog.

THE NATIONAL TERRAZZO and MOSAIC ASSOCIATION

1406 G Street NW, Washington, D. C.

Bright and colorful, yet durable and low in maintenance cost, terrazzo makes an ideal material for entrance halls, lobbies, school offices and corridors

A Buyers Service for School Executives

The National Terrazzo and Mosaic Association, Inc., maintains an office located at 1406 G Street NW, Washington, D. C., to which school executives and architects can turn for authentic information on terrazzo.

● Made with marble chips, portland cement and water, plus mineral color pigment where desired, and separated by dividing strips to guard against cracking, terrazzo floors have these advantages: (1) colorful beauty, (2) flexible, individual designs, (3) permanence and durability, (4) economy and ease of installation and maintenance.

Wear-proof Floors

For floors in the entrances, corridors, classrooms, offices and laboratories of school buildings, where severe wear makes durability the major flooring requisite, terrazzo provides a dense, hard, wear-proof surface. And because the range of color in marble chips, divider strips and matrice combinations is practically unlimited, terrazzo is as colorfully beautiful as it is durable.

In design there are likewise no limitations. Simple, repetitive patterns or detailed pictorial designs are carried out in terrazzo floors precisely as planned. Each terrazzo floor may have an **individual** motif, or the terrazzo floors throughout the school building may follow one central design.

Durable—But Not Drab

School floors must be durable, but they need not be drab. School floors can be bright and colorful and cheerful and at the same time give long, economical service—built with terrazzo. Detailed information and complete specifications will be sent promptly upon request.

In addition to its permanent durability and good appearance, terrazzo's flexibility in design (well illustrated in this floor with its map design) makes it particularly appropriate for school use

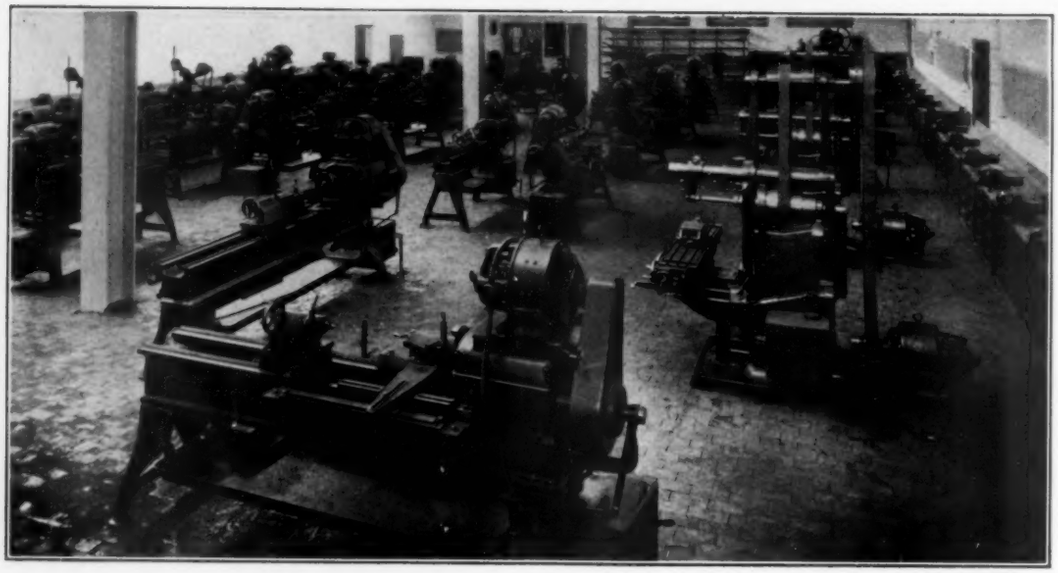
Practical application of terrazzo in swimming pool construction

Colorful, durable terrazzo floor in Samuel Gompers High School for boys in New York City

THE JENNISON-WRIGHT COMPANY

Toledo, Ohio

BRANCHES IN ALL LARGE CITIES



Kreolite Separate Wood Block Floors serve in the school and educational institution no less than in the factory and work shop where today their use is so general as to reveal Kreolite as the national choice for heavy-duty service.

Especially is Kreolite specified for all departments where mechanical operations are carried on. Tools are not damaged when they are dropped, for the Kreolite floor is resilient. The floor is not damaged because wear and accident leave no appreciable impression upon the tough end grain surface of the specially treated selected wood blocks.

Among the scores of leading educational institutions now enjoying the economy and benefit of Kreolite Wood Block Floors are: Cleveland High School, Cleveland, Ohio; Jefferson High School, Los Angeles, Calif.; Lindbloom High School, Chicago, Ill.; University of Michigan, Ann Arbor, Mich.; Purdue University, Lafayette, Ind.; Technical School, Indianapolis, Ind.; University of Illinois, Urbana, Ill.; University of Wisconsin, Madison, Wisc.; Yale University, New Haven, Conn.

Write for complete information

KREOLITE

WOOD BLOCK FLOORING

Kreolite Wood Block Floors Used in Over 135 Schools!

Kreolite Flexible Strip End Grain Wood Block Floor in the Gymnasium of the New York State Vocational Institution, West Coxsackie, New York

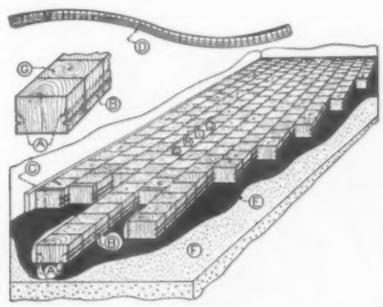
One of the many Kreolite gymnasium floors giving maximum of resilience, safety, appearance, wear, non-slipping, and all around satisfaction as to its ability to successfully withstand gymnasium play of all kinds.

The value of Kreolite Flexible Strip End Grain Wood Block Flooring is recognized instantly by the modern architect of schools and public buildings. They cannot become loose in the floor. The durability is practically limitless as the strips are laid with the tough end-grain of the individual blocks uppermost. The light natural color and beauty of the wood are retained, although the blocks are treated with a transparent, waterproof preservative.

Complete Information Sent on Request

(a)—Metal wire truss binding the individual blocks into a compact, solid monolithic-like end-grain plank or strip.

(b)—Metal spline binding the individual strips together.



(c)—Cork expansion joint laid flush with the surface of the floor.

(d)—Flexibility—can be laid over wood sub-floor, in mill type buildings.

(e)—Waterproof membrane between concrete and strips.

(f)—Smooth finish concrete foundation.

(g)—Surface sanded smooth.

(h)—Manufactured from properly dried yellow pine or redwood.

(i)—Treated with a transparent, odorless, waterproofing preservative so that the natural light color of the wood is maintained. The surface of the floor may be waxed and highly polished if desired, presenting a most pleasing and beautiful design.

(j)—Laid with the tough end-grain up. End-grain blocks run full depth of strips, from top to bottom, each block being anchored to the base, in a bed of mastic.

Kreolite Wood Block Floors Used in Over 135 Schools!

NATIONAL WOOD PRODUCTS

DIVISION OF
EVANS PRODUCTS COMPANY
Fullerton at Greenfield Road, Detroit, Michigan

Before
This typical old hall (above) was dangerous as well as unsightly

After
Re-finished in EVANITE, the same hall has become modern in appearance and once more useful

WOOD FLOORING

Since the days of the little red schoolhouse, advances in the care and health of the student have kept pace with progress in educational methods. No one item in the new or modernized schoolhouse is more important to the well-being and comfort of the student than flooring.

Resiliency must be there. Permanency is important and, withal, there should be beauty at reasonable cost.

Evans Products Company offers EVANITE for class rooms, halls, libraries and assembly rooms—LAMINITE for gymnasiums, stages, auditoriums and other points where quietness and beauty are needed—EVERLEVEL for laboratories, workshops and other heavy duty requirements.

EVANITE — "The Floor Beautiful"

Whether the problem is one of new construction or modernization, EVANITE wood block flooring, with its patented spring expansion joints, is the logical answer.

Here is the beauty and life of selected-grain wood coupled with permanency and trouble-free usefulness.

Laid directly on concrete subfloors in a cushion of mastic, which retains its resiliency indefinitely, EVANITE is quiet, sanitary and fire resistant.

Specially milled from thoroughly air and kiln dried selected stock (not standard strip flooring stock) EVANITE consists of accurately machined strips joined with a special waterproof casein glue and two hardwood dowels inserted entirely through each block, at right angles to the grain of the wood.

An unusual feature of EVANITE installations is a highly efficient spring expansion joint providing most complete protection against expansion and contraction in wood block floors.

At the right is shown a typical school gymnasium floor in LAMINITE. Beauty and iron-like wearing quality are combined. LAMINITE actually forms the permanently smooth surface (free from cupping) which is essential in gym floors

North Collins, N. Y., Central School. Bley & Lyman, Buffalo, architects

LAMINITE — "The Floor Eternal"

LAMINITE fir plywood flooring might be called the prodigy of the Evans flooring family. There is no floor like LAMINITE. Its fully patented features set it up in a class by itself.

The principle of plywood is not new. Neither is the great wearing quality of end grain a recent discovery, but it was left to LAMINITE to combine the strength and resiliency of plywood construction with the wear-resisting features of end-grain wood.

The largest and finest Douglas fir logs go into the manufacture of this flooring. Alternate strips of end and edge grain laminations are put together with waterproof glue, tongued and grooved and bored for lateral nailing. The result is a floor which positively will not cup.

LAMINITE is used for all installations from library to work shop, particularly where quietness is desired and appearance also is important. Typical examples are class rooms, gymnasiums, stages, auditoriums, and manual training rooms.

Manufactured in seven foot strips and in thicknesses from $1\frac{1}{16}$" to $3\frac{1}{2}$" LAMINITE flooring may be laid in any manner in which other types of flooring are installed. It may be applied in mastic directly on concrete subfloors, on sleepers, or nailed to wooden subfloors.

Nashua High School, N. Y. Wells, Hudson and Granger, architects

EVERLEVEL — "The Heavy Duty Floor"

Where extremely heavy traffic is the rule EVERLEVEL is the answer. Applied in resilient mastic, EVERLEVEL is a remarkably quiet floor for shops, receiving rooms and other places requiring exceptional wearing quality but where natural noise must be deadened.

EVERLEVEL is not just another wood block flooring. Its steel spline construction is such that it forms a cohesive covering rather than the loose, unconnected mass often found in block installations.

EVERLEVEL is made from selected yellow pine in $1\frac{1}{2}$", $1\frac{3}{4}$", 2" or $2\frac{1}{2}$" thicknesses. The individual end grain blocks are assembled into strips up to 6 feet in length by means of full length dowels. The strips are then completely secured into a single unit by tight fitting galvanized steel splines laid in continuous strips the entire length or width of the floor.

Parrish Centennial School, Wilkes-Barre, Pa.
Thomas J. Foster, Wilkes-Barre, Pa., architect

Catalog and specifications for each type of floor will be furnished on request

MAPLE FLOORING MANUFACTURERS ASSOCIATION

332 South Michigan Avenue, Chicago, Ill.

Floor *with* Maple

In Class Rooms, Assembly Halls, Shops and Gymnasiums

PRODUCTS

MFMA trademarked Northern Hard Maple, Beech and Birch Floorings, standardized and guaranteed as to grade and manufacture.

QUALITIES

Northern Hard Maple—a tight grained, hard fibered wood—has the school-room floor essential qualities of long wear, smoothness, cleanliness and foot comfort. Economical in installation and maintenance cost. Provides firm anchorage for desks, facilitates alterations.

GOOD SERVICE FINISHES

Service finishes that seal the surface of Hard Maple, keep out dirt, resist soil stains, prove non-slippery—now available. Will not mar, scratch or flake off. Easy to clean and economical to maintain.

GRADING RULES

MFMA Northern Hard Maple, Beech and Birch Floorings are kiln-dried, sold in standard grades, described in detail in a book of Grading Rules, available on application.

Standard lengths, 25/32 inch and thicker strip flooring as follows:

MFMA First Grade: 2 to 16 feet, may contain up to 25% of 2 to 3½ feet, inclusive.

MFMA Second Grade: 1½ to 16 feet, may contain up to 40% of 1½ to 3½ feet, inclusive.

MFMA Third Grade: 1 to 16 feet, may contain up to 60% of 1 to 3½ feet, inclusive.

STANDARD MEASUREMENT

Flooring ½ inch and thicker, all faces, is measured ¾-inch waste for matching.

Flooring ⅜ inch (11/32-inch) thick, all faces, is measured ½-inch waste for matching.

Jointed flooring, all thicknesses and faces, is measured ½-inch waste.

STANDARDIZATION

MFMA flooring is made to accurate specifications standardized by the Association. The Association maintains supervision over the products of its members through regular grade inspection at mills and its re-inspection service. Competent inspectors are employed for this purpose.

PATTERNS

You can lay Maple in strips or blocks—with or without pattern—over screeds, wood or concrete subfloors.

THICKNESSES AND FACES

Popular sizes of Hard Maple strip flooring are 25/32", 33/32" and 41/32" thicknesses in the 1½" (25/32" only), 2", 2¼" and 3¼" face widths.

Hard Maple block flooring, cut to exact, uniform lengths, in 25/32" and 33/32" thicknesses, is available in individual blocks and in fabricated squares or rectangles.

LITERATURE FOR FREE DISTRIBUTION

The following booklets and folders are offered through the office of the Association, and will gladly be mailed on request, free of charge:

"**MFMA** Grading Rules and Standard Specifications, including other data of value to Architects—issued in filing pocket folder of A.I.A. file size" (May, 1935, edition).

"Heavy Duty Finishes for Maple Flooring—**MFMA** Approved."

"Grading Rules for **MFMA** Floorings—pocket size."

"Hard Maple Flooring"—a folder containing reproductions of the product.

Hard Maple Floor in Foster School, Evanston, Illinois, 35 years old, reconditioned with Heavy-Duty finish — floor previously scrubbed — no treatment

Laying Hard Maple Block Flooring in the University of Minnesota Indoor Sports Building

Let our Service and Research Department assist you with your flooring problems. Write us

ROBBINS FLOORING COMPANY

Members M. F. M. A — N. H. F. C.

Manufacturers of

Northern Hard Maple, Birch and Wisconsin Oak Flooring
"Ironbound" Wood Blocks and Strips, Parquetry

Mills: Rhinelander, Wis.
Newberry, Mich.

Rhinelander, Wisconsin

PRODUCTS

ROBBINS Hard Maple, Birch and Wisconsin Oak Strip Flooring, Bowling Alley and Squash Court Maple, Individual Piece Blocks for Laying in Mastic. "IRONBOUND" Unit and Continuous Strip Blox. Special Flooring Items made to order.

FEATURES

Exceptional Durability.
Smooth, non-slippery surface.
Beauty in color and texture, restful appearance.
Moderate initial cost, low maintenance outlay.
Warmth, foot-comfort, resilience.
High sanitary qualities.

STRIP FLOORING

ROBBINS Strip Flooring is Nature's ideal product —grown and processed in Upper Michigan and Wisconsin, "M. F. M. A." graded from properly seasoned, kiln dried lumber, made in all standard sizes and grades from 3/8" x 1½" to 53/32" x 3¼" face width. Specified many years for laying on sleeper construction for nailing.

BLOCK FLOORING

Herringbone Single Piece Blocks are made with flat backs and special grooves for laying in mastic. Each piece supported by six adjoining pieces. A strongly-built, practical floor, fully able to withstand the rigorous treatment given school room floors.

"IRONBOUND" Unit Blox are assembled in squares, rectangles and panels, the entire floor interlocked with saw-tooth steel splines. A most substantial attractive school room floor. By test the best constructed unit block in existence.

"IRONBOUND" Continuous Strip Blox are of uniform length, laid in straight courses, tied in with long steel splines, making the strongest, most durable wood floor known. Combines the simplicity of strip flooring with the uniformity of parquet.

All ROBBINS mastic-set floors are absolutely squeak-proof, non-resonant, more fire resistant than other types, chemically treated to prevent vermin attack.

ROBBINS Hard Maple Flooring, Strip Type, was selected by the Minneapolis School Board for this school. Ramsey Junior High, Minneapolis, Minn.

Minneapolis School Board, Architects; Midwest Contracting Company, Minneapolis, Minnesota, Contractors

PARTIAL LIST OF EDUCATIONAL BUILDINGS USING ROBBINS FLOORING

Princeton University, Princeton, N. J.
Penn State University, State College, Pa.
Fordham University, New York City
Vassar College, Poughkeepsie, N. Y.
Amherst College, Amherst, Mass.
Women's College, San Francisco, Calif.
J. E. Burke High School, Boston, Mass.
Walton High School, New York City
24 Grade and High Schools, Long Island, N. Y.
Pocantico Hills School, Pocantico Hills, N. Y.
Grant Union High School, San Francisco, Calif.
Arlington School, Lexington, Ky.
Grade and High School, Burlington, Iowa
High School, Inverness, Mont.
Grade and High Schools, Oklahoma City, Okla.
Schools at Fredonia, Kans., Carys Brook, Va., Terre Haute, Ind., Ottumwa, Iowa, Mt. Grove, Mo.
Grammar School, West Point, N. Y.
Virginia State College for Negroes, Petersburg, Va.

Because of its well earned reputation for quality and uniformly fine workmanship, ROBBINS Flooring is specified by architects for more educational buildings than any other brand of hardwood flooring. **Write for our new 44 page brochure, "Late American Floors,"—a comprehensive, concise discussion of mastic-set wood floors, designed to aid architects, engineers and school executives.**

Installation of Block Type Maple, Vocational School, Manitowoc, Wisconsin
Wm. Raeuber, Architect; Schuette Construction Company, Contractors

AMERICAN MAT CORPORATION

1700 Adams Street, Toledo, Ohio

EZY-RUG Colored Rubber Link MATTING

ONE OF THE 25 PRODUCTS OF AMERICAN MAT CORPORATION — A MAT FOR EVERY PURPOSE

Graphic proof that Ezy-Rug Matting really traps the dirt at the door and keeps it out of the building

Illustrated is an installation of Ezy-Rug Matting at Purdue University, Lafayette, Indiana

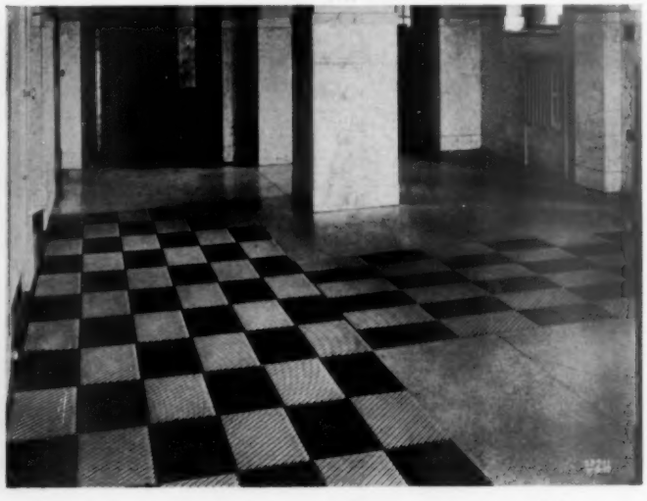
EZY-RUG Colored Rubber Link MATTING

ENDS SLOPPY, SLIPPERY FLOORS
TRAPS THE DIRT AT THE DOOR
PREVENTS TRACKING THROUGH THE BUILDING
REDUCES CLEANING COSTS
SLIP-PROOF
TRIP-PROOF

Write for folder and prices on mats for any purpose. A staff of matting engineers and distributors throughout America

American Mat Counter Tread is used in kitchens to afford safety, reduce breakage and greatly increase efficiency

An installation of Rub-O-Rug, another popular product of American Mat Corporation



AMERICAN ABRASIVE METALS CO.

Irvington, New Jersey

NEW YORK OFFICE: 50 Church Street CHICAGO OFFICE: 111 W. Washington Street

AGENTS IN

BOSTON LOS ANGELES PITTSBURGH
ST. LOUIS PHILADELPHIA SAN FRANCISCO

For 25 years

THE TREAD OF SAFETY AND ECONOMY

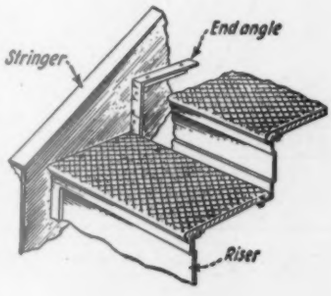
FERALUN Treads prevent slipping accidents on stairs and eliminate repair bills and further maintenance cost. In the Washington Irving High School, N. Y. C., Feralun Treads were installed 25 years ago; since then no accidents have been reported nor repairs required. Over 1900 schools, within a period of five years, were equipped with FERALUN, a record unequalled in the safety tread field.

FERALUN is an iron base, in the surface of which is imbedded abrasive material, assuring you a safe footing under any conditions. The abrasive is carried down over the nosing edge, the point of most accidents.

FERALUN for Repairs. FERALUN is easily applied and comes to you with holes drilled, ready for convenient installation. The illustration shows how they are superimposed on existing treads of wood, slate, cement, marble, or iron. Where existing treads are worn and hollowed out, first they are filled in with cement and the FERALUN is attached with either wood screws or expansion shields.

BRONZALUN or ALUMINUM — the same as FERALUN except for the metals—is frequently used in main stairways.

FERALUN for New Construction. At the right is illustrated a tread especially designed for schools. Its wide acceptance is due to its simplicity of erection, its non-slip qualities, and long wear.



We have prepared an interesting leaflet on stairway requirements in schools which we shall be glad to send you upon request.

Write for samples and catalogues

AMERICAN MASON SAFETY TREAD CO.

GENERAL OFFICE AND FACTORY

Lowell, Mass.

DESCRIPTION: A metal plate of Iron, Bronze or Aluminum impregnated with abrasive grains or flint like particles projecting above the surface presents a NON-SLIP stair tread both durable and safe under all conditions.

APPLICATION: Stair treads and platforms for new or old construction, ramps, door and elevator saddles, floor plates, trench covers, and spiral stair treads.

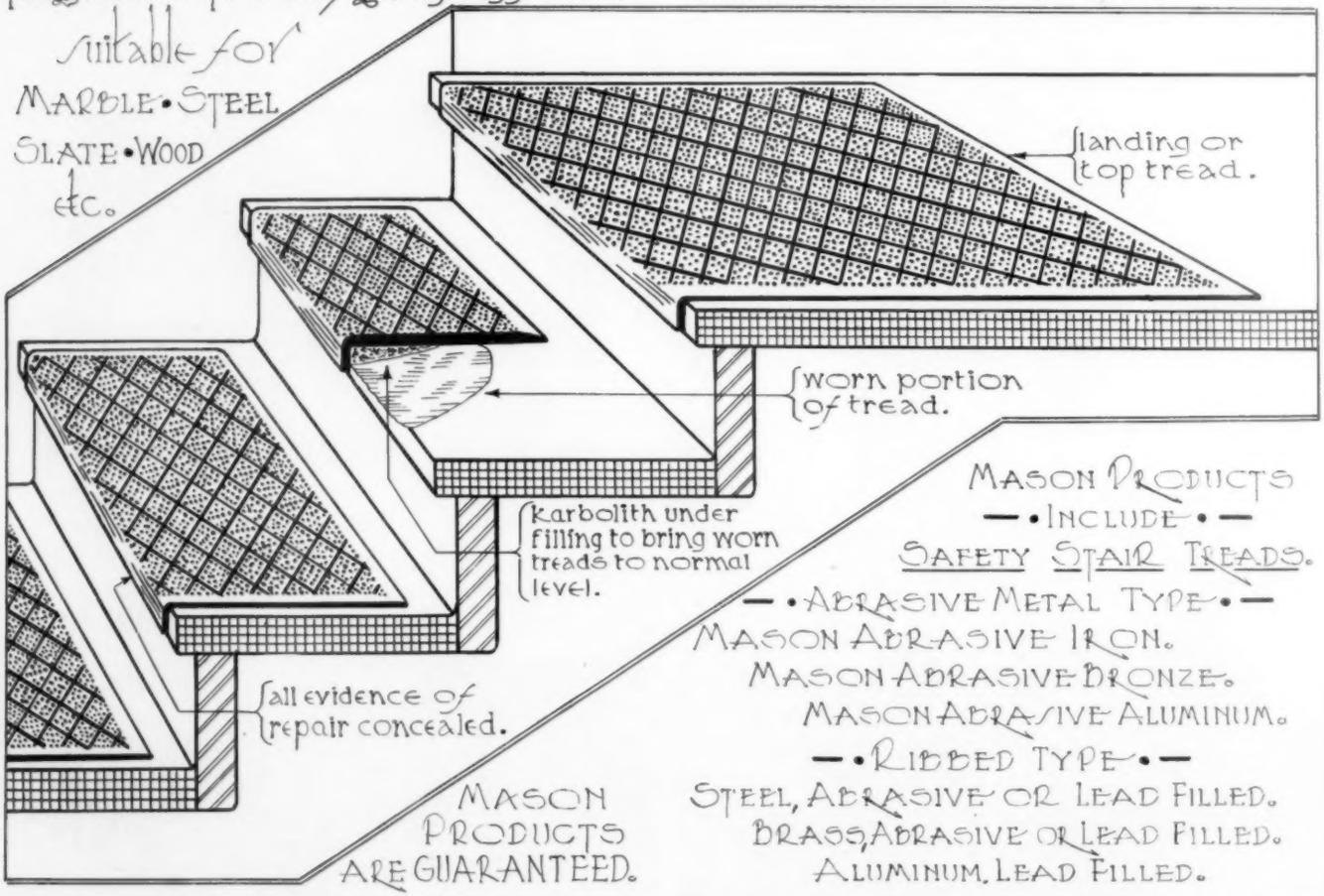
ASSISTANCE: Solution of stair and slipping hazzard problems gladly suggested.

ADVANTAGES: Painful accidents on new or worn stairs can be prevented economically by application of Mason Abrasive Iron or Mason Ribbed Type Safety Treads.

MASON SAFETY TREADS are used by Educational and Religious Institutions, in Public Terminals, and Industrial Plants etc.

MASON SAFETY TREADS are recommended by leading Architects, Safety Engineers and Insurance Companys.

RECOMMENDED METHOD OF APPLYING MASON ABRASIVE METAL TO WORN STAIR TREADS.


Suitable for
MARBLE • STEEL
SLATE • WOOD
etc.
landing or top tread.
worn portion of tread.
karbolith under filling to bring worn treads to normal level.
all evidence of repair concealed.

MASON PRODUCTS ARE GUARANTEED.

The oldest natically known safety tread manufacturer in the United States.

CATLOGUE AND SAMPLES SUPPLIED WITHOUT OBLIGATION.

MASON PRODUCTS
— • INCLUDE • —
SAFETY STAIR TREADS.
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MASON ABRASIVE BRONZE.
MASON ABRASIVE ALUMINUM.
— • RIBBED TYPE • —
STEEL, ABRASIVE OR LEAD FILLED.
BRASS, ABRASIVE OR LEAD FILLED.
ALUMINUM, LEAD FILLED.
KARBOLITA UNDERFILLING AND FLOORING.
MASON STAIR NOSINGS AND EDGINGS.
MASON SAFETY LADDER SHOES.
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THE SAFE TREAD COMPANY

Manufacturers of

The Improved Abrasive Metal
—"SAFE TREAD"—

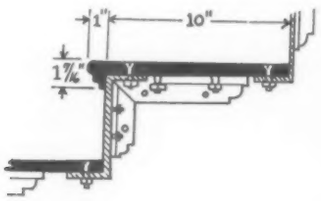
(Listed by the Underwriters Laboratories)

IRON—BRONZE—ALUMINUM

220 Broadway, New York City

AGENTS IN ALL PRINCIPAL CITIES

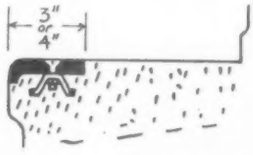
The necessity of providing slip-proof walkways for the safety of children and teachers has been established by the courts.



STYLE N5—FOR NEW CONSTRUCTION

Maintenance costs are likewise of utmost importance.

The use of "Safe Tread" Stairtreads—Door Sills, Platforms, Landings, etc., for new construction or repairs to existing walkways will insure the highest degree of **Nonslip** qualities and the greatest amount of **wearability.**

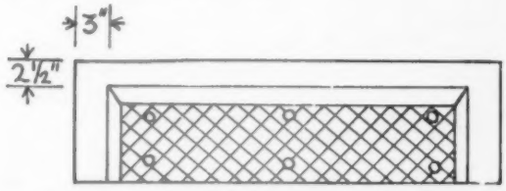


STYLE XL NOSINGS—FOR NEW CONCRETE

When Ordering or Requesting Quotation

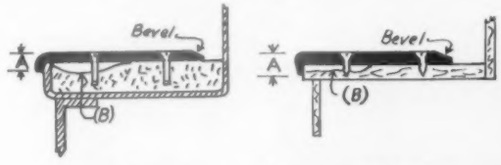
Specify iron, bronze or aluminum Safetread—style nosing desired, width overall or back of nosing, length, surface design (see below), quantity of each size. If unusual shapes are required furnish detail sketch or template. If for repairs advise what type material is being covered.

Submit your walkway problems to us, we shall be glad to help you solve them.



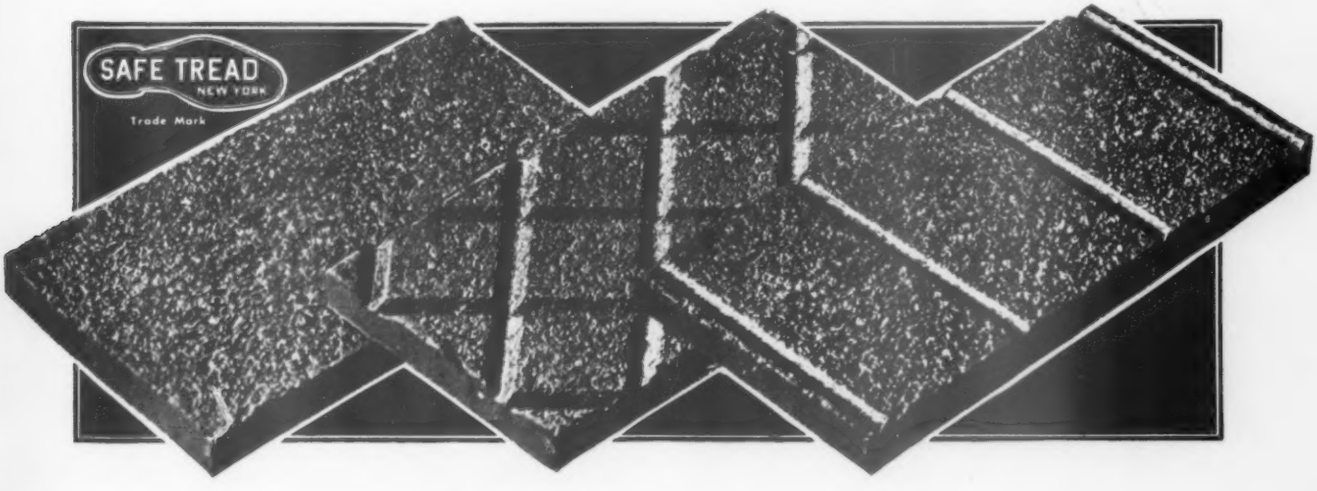
STYLE L—LIP ALONG FRONT EDGE, BEVELED BACKS AND ENDS

Recommended practice for repairs carry new tread to within 2½" of back edge of existing step and to within 3" of side of existing step.



STYLE L—FOR REPAIRS

	Concrete or Pan Filled	Wood, Marble or Stone
(A)	¼", ½", ¾", 1" or 1½", whichever required to cover worn area.	
(B)	Fill worn spots with cement before putting new treads in place. Secure with lead sleeves and wood screws.	



WOOSTER PRODUCTS INC.

Wooster, Ohio

NEW YORK OFFICE: 101 Park Ave. CHICAGO OFFICE: 324 W. Washington St.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

WOOSTER SAFE-GROOVE TREADS

Steel Base, Yellow Brass Base, White Alloy Base.

WOOSTER ABRASIVE CAST TREADS

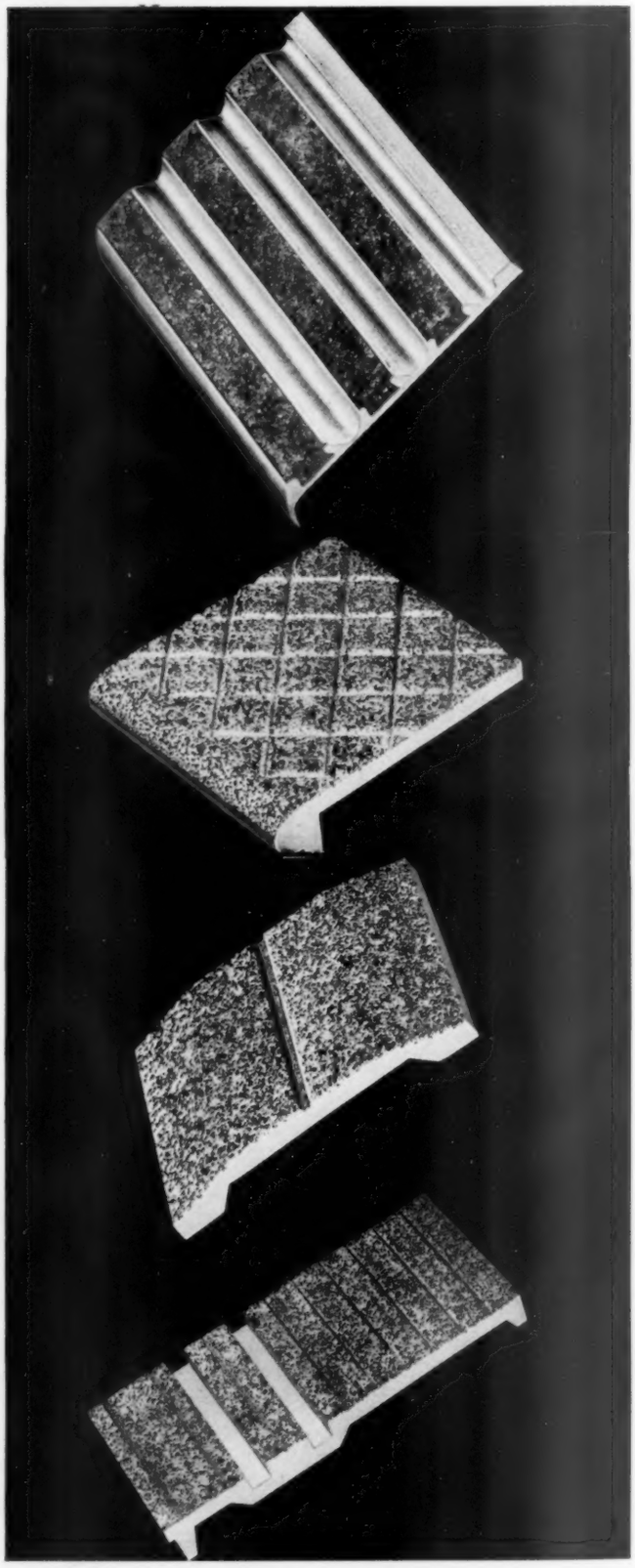
Ferrogrit, Alumogrit, Bronzogrit, Nicklogrit.

Wooster Safety Treads prevent falls from slipping on stairs. On new or old stairs they provide a maximum degree of safety. On new stairs they prevent wear and tear which makes steps dangerously hollowed out, smooth and slippery. They reduce stair maintenance costs to a minimum. Once installed, the treads last for years under hard usage. And, if they do wear out, are easily and economically replaced.

For easy, economical repair of present stairs, they are unsurpassed. Easily and quickly installed on steps of any material.

Wooster Safe-Groove Treads are made with alternate ribs of anti-slip and deep, safe-grooves. Made in three different metals, steel base, yellow brass base and white alloy base, and the anti-slip ribs may be either abrasive grits or lead.

Wooster Abrasive Cast Treads are cast metal treads with grains of abrasive grits cast right into the walking surface. They are made in four different metals, cast iron, cast aluminum, cast bronze and cast nickel bronze, and are sold under the trade names of Ferrogrit, Alumogrit, Bronzogrit and Nicklogrit.



WOOSTER METAL MOULDINGS

For use with wall covering materials such as Linoleum, Rubber, or Asbestos Tile, Plywoods or Hardboards. Highly decorative; easily installed with either flexible or rigid materials. Suitable for use in Dormitories, Classrooms, Offices, Auditoriums, Cafeterias, Kitchens, Bathrooms, etc. Made in extruded White Alloy Metal, or Stainless Steel. Standard finish is a beautiful, glistening, mirror-like Woosterlite; Satin, or Matte also available at no extra cost. Also furnished in six colors. Samples and complete information gladly sent upon request.

WOOSTER NOSING AND EDGING

Primarily designed to protect exposed edges of floor coverings and furnish a trim to enhance the beauty of the floor covering material. Widely used with linoleum, rubber and similar materials for table, desk, counter tops, etc. Made of solid extruded White Alloy Metal and Yellow Brass. Illustrated Price Lists, Circulars and samples gladly sent upon request.

BOLGER-HELLER SLATE CO.

Quarriers and Manufacturers

Bangor, Pa.

SALES REPRESENTATIVES IN THE PRINCIPAL CITIES

GENUINE Paramount SLATE

REG. U. S. PAT. OFF.

ALBION-BANGOR

PRODUCTS

Blackboards	Stair Treads
Roofing Slate	Toilet Enclosures
Shower Stalls	Wainscoting

And structural slate for all requirements

PARAMOUNT VELVET FINISH SLATE BLACKBOARDS

All slate designed for blackboards is subjected to rigid inspection and only clear blemish-free stock is used. This selected slate is polished by machine until it is entirely free of sand pits and of any surface irregularity. The level surface is then gone over carefully by hand. It is this final hand rub that produces the Paramount Velvet Finish—a writing surface of permanent satisfaction.

Facilities: Our quarries and reserve stock are adequate for all demands. Whatever your slate requirements, we invite you to avail yourself of our consulting service.

SPECIFICATIONS COVERING
"PARAMOUNT"
NATURAL SLATE BLACKBOARDS

QUALITY: All Blackboard Slate shall be quarried in the United States and be of the finest quality selected blackboard stock, even black color, free from veinings or imperfections that would impair its use or durability as a marking surface.

THICKNESS: The thickness of all finished blackboards shall be not less than ¼ inch nor more than ⅜ inch. A maximum deviation of 1/16 inch from this thickness will be permitted when an average thickness of at least ¼ inch is maintained except that double surfaced slate shall be of uniform thickness.

FINISH: The writing face of each blackboard shall be carborundum surfaced to a true, even, uniform and finely smoothed surface. Each blackboard shall be furnished with joints ground straight, true and neatly fitted.

HEIGHT: The height of all blackboards shall be 3′ 0″, 3′ 6″, or 4′ 0″ high (designate which height).

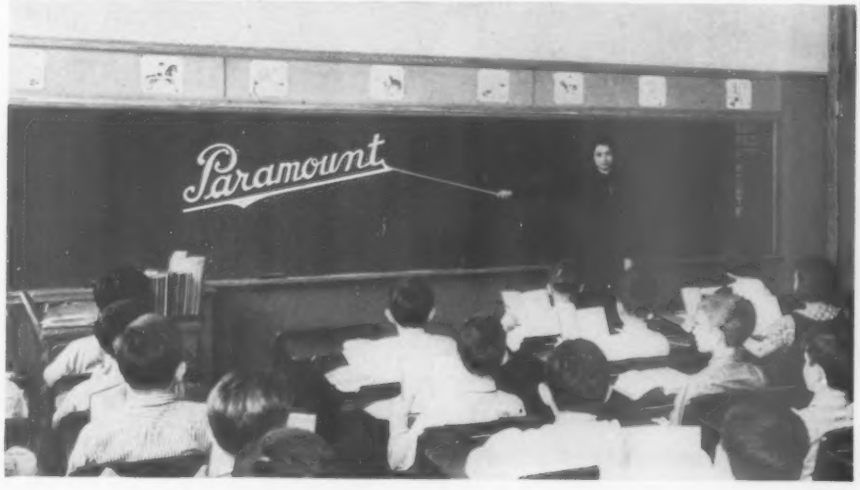
LENGTH: The length or lineal dimensions of the slate in each assembly of blackboards shall be in accordance with the U. S. Department of Commerce Simplified Practice Recommendations No. R15-35, all as follows:

Up to 5 feet, one slab;
Over 5 feet, but not exceeding 9 feet, two slabs;
Over 9 feet, but not exceeding 13 feet 6 inches, three slabs;
Over 13 feet 6 inches, but not exceeding 16 feet, four slabs;
Over 16 feet, but not exceeding 22 feet 6 inches, five slabs;
Over 22 feet 6 inches, but not exceeding 27 feet, six slabs.

JOINTS: The joints in each assembly shall be in accordance with the same Departmental Recommendation, namely, at or near the middle of the space for two slabs, one-third of the space for three slabs, one-fourth of the space for four slabs, one-fifth of the space for five slabs and one-sixth of the space for six slabs.

By "at or near" is meant that any slab may be used which places the joint within three inches in either direction of what would be exact spacing of the units stated.

BOLGER-HELLER SLATE COMPANY, INC.,
BANGOR, PENNSYLVANIA.



A Recent Installation of Paramount Slate Blackboards in a Public School, Brooklyn, N. Y.

NATURAL SLATE BLACKBOARD CO.

EXECUTIVE OFFICES
Pen Argyl, Pa.

BRANCHES

ATLANTA, GA., 213 Red Rock Bldg.
BUFFALO, N. Y., Erie County Bank Bldg.
CHICAGO, ILL., 737 N. Michigan Ave.
CINCINNATI, OHIO, 3629 Idlewild Ave.
DALLAS, TEXAS, P. O. Box 2324
DETROIT, MICH., 111 Gladstone
KANSAS CITY, MO., 1730 Grand Ave.
MINNEAPOLIS, MINN., 1822 Jefferson NE.
MEMPHIS, TENN., 215 Falls Bldg.
NEW YORK, N. Y., 110 E. 42nd St., Rm. 701
PHILADELPHIA, PA., 244 N. 10th St.
PITTSBURGH, PA., Rm. 208 Investment Bldg.
ST. LOUIS, MO., 1617 Lafayette Ave.
SOMERVILLE, MASS., 43 Prospect St.
WASHINGTON, D. C., 327 Bond Bldg.
NEW ORLEANS, LA., 816 Howard Ave.

NATURAL SLATE BLACKBOARDS

The superiority of natural slate blackboards over any type of composition board is too well known to require any further mention.

The production of blackboard slate is confined to a single small area in Lehigh and Northampton Counties, Pennsylvania. The quarries in these counties produce the best blackboard material on account of the unusually fine cleavage of the slate and the thickness and size of the beds. Up to 1916, the demand for blackboard slate was taken care of by many individual companies independently operating separate quarries. The organization of the majority of these companies in that year to form the **Natural Slate Blackboard Company** has made possible the highest type of production, storage and service facilities, unequaled except by those of the **Structural Slate Company,** which in the field for **other** uses of slate comprises the member quarries of the **Natural Slate Blackboard Company** and others in the same district.

The "Pyramid" Brand, the name given to all slate furnished by the Natural Slate Blackboard Company, was adopted as a trademark and as a guarantee of the enforcement of the most rigid rules of workmanship and inspection in order to assure the best possible selection for the purpose. Calling for "Pyramid" Brand not only provides a selected slate from the best slate beds in the world but assures you of unsurpassed workmanship and delivery service

Facilities and Service of the Natural Slate Blackboard Company

Selected quarries have been specially equipped to develop maximum production of the particular kinds and sizes of slate blackboards for which such quarries are best adapted.

Methods of extraction and storage have been coordinated.

Increased mill production has been facilitated through division of work among these quarries.

This organized procedure enables a huge and constantly moving stock to be always available, from which, without any delays whatever, shipments may be made of any quantity of slate in sizes to meet any requirement.

Each slate blackboard expertly finished, fitted and jointed, assures continued satisfaction through the equipment and service of this Company. The facilities of our Service Department at Pen Argyl and of our branch offices are at the disposal of every user. **Write to, or consult, the branch office nearest you, in regard to any information desired, on "Pyramid" natural slate blackboards or any other uses of slate.**

A minimum of 500,000 sq. ft. carried constantly in stock ensures guaranteed prompt deliveries.

Typical Class Room, Teachers College, Buffalo, N. Y. William E. Haugaard, Commissioner of Architecture, New York State

THE STRUCTURAL SLATE COMPANY

EXECUTIVE OFFICES
Pen Argyl, Pa.

BRANCHES

ATLANTA, GA., 213 Red Rock Bldg.
BUFFALO, N. Y., Erie County Bank Bldg.
CHICAGO, ILL., 737 N. Michigan Ave.
CINCINNATI, OHIO, 3629 Idlewild Ave.
DALLAS, TEXAS, P. O. Box 2324
DETROIT, MICH., 111 Gladstone
KANSAS CITY, MO., 1730 Grand Ave.
MINNEAPOLIS, MINN., 1822 Jefferson NE.
MEMPHIS, TENN., 215 Falls Bldg.
NEW YORK, N. Y., 110 E. 42nd St., Rm. 701
PHILADELPHIA, PA., 244 N. 10th St.
PITTSBURGH, PA., Rm. 208 Investment Bldg.
ST. LOUIS, MO., 1617 Lafayette Ave.
SOMERVILLE, MASS., 43 Prospect St.
WASHINGTON, D. C., 327 Bond Bldg.
NEW ORLEANS, LA., 816 Howard Ave.

STRUCTURAL SLATE FOR VARIOUS SCHOOL USES

In addition to producing the world's best blackboard slate, Northampton and Lehigh Counties of Pennsylvania also produce an abundant supply of the highest grade structural slate for various other uses. The majority of the quarries in this far-famed slate district cooperate through one organization —the **Structural Slate Company**—in order to develop the most efficient standards of extraction, workmanship, assembling, distribution and methods of installation, as well as to encourage the maximum production and use of slate. All slate produced by this organization is thoroughly inspected before and after working, and is given the trade name of "Pyramid."

"CENTURIES OF SERVICE"
PYRAMID
NATURAL SLATE
STRUCTURAL
Proof against Time - Wear - Water - Fire!

"Pyramid" Brand slate assures the consumer of receiving always the highest quality of slate, selected by experts, and fabricated in any desired size for such uses as toilet enclosures, urinal stalls, shower stalls, laundry tubs, sinks and sink tops, stairways, caps, bases, wainscots and floors. Many standard sizes are always in stock, and deliveries can be made promptly. Normal capacity—5 carloads daily

Structural Characteristics of "Pyramid" Slate

Among the chief characteristics of structural slate from the Pennsylvania quarries are its **fine, even grain,** its **uniform color,** and its **cleavage or fissility,** which allows it to be split into slabs of any required thickness. Slate is also one of the **least absorptive** of nature's products, having a mean absorption of only 174/1000 of one per cent when immersed in water for 24 hours. It is also extremely **tough** and **elastic,** as manifested by its resistance to strain, shock, blows and the effect of settlement. Moreover, it **will not contract or expand** under changing conditions of heat or humidity.

Uses of "Pyramid" Structural Slate in School Buildings

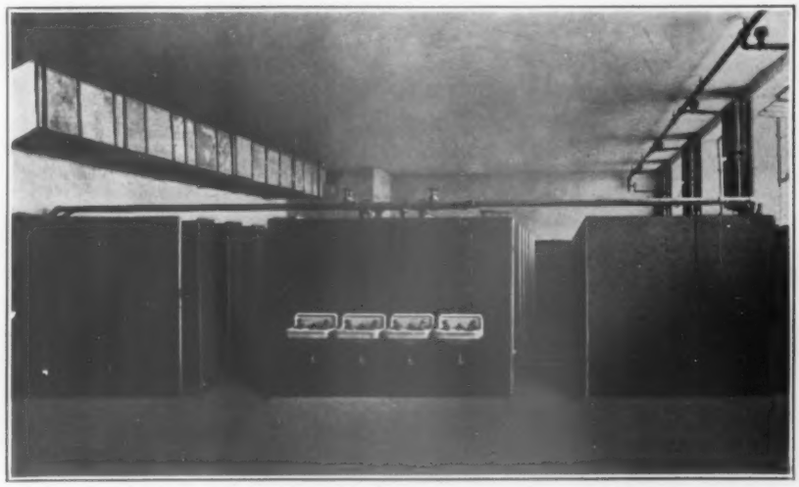
The most common uses of "Pyramid" structural slate in school buildings are for **shower stalls** and **toilet enclosures.** A review of the characteristics of structural slate in the preceding paragraph quickly shows why this slate is admirably fitted for these two uses. In selecting fixtures used for plumbing and sanitary purposes, slate will be found to fulfill easily the most rigid requirements with respect to resistance to wear and tear, sanitary qualities and imperviousness to water.

Other school uses for "Pyramid" Slate include:

BASE TREADS AND PLATFORMS TILE
RISERS SWITCHBOARD PANELS COPING
FLAGGING STOOLS & SADDLES SHELVING
PARTITIONS FLOORS & WALKS THRESHOLDS
URINAL STALLS WINDOW SILLS SINKS & TRAYS
ROOFING SLATE TABLE TOPS RADIATOR TOPS

Write us direct or our nearest Branch Office for estimates and any other information desired.

Use slate for stairways. It is fire-resistant and wear-resistant!



Slate shower installation in High School building, Bethlehem, Pa.

BLUE RIDGE GLASS CORPORATION

Kingsport, Tenn.

BLUE RIDGE

OPTEX GLASS BLACKBOARDS

Distributed by

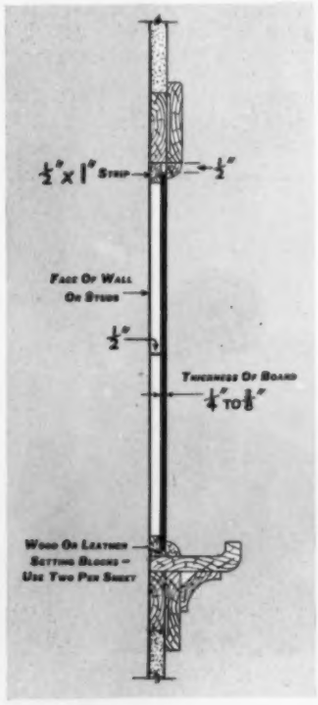
LIBBEY-OWENS-FORD GLASS COMPANY

Toledo, Ohio

● Optex Glass Blackboards are more serviceable, more efficient and more attractive. For several years highly successful results have been obtained with Optex Glass Blackboards by schools, offices and industrial plants in various sections of the country.

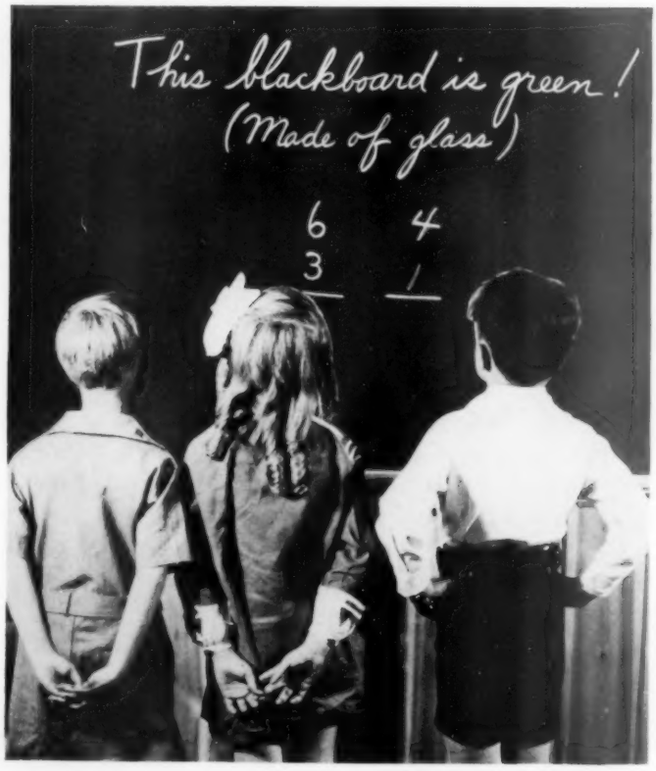
Available in black and green or other colors on special orders, Optex blackboards fit any color scheme. Reflection of light, always a problem, is practically eliminated—eyestrain is reduced and visibility increased. Colors are permanent and uniform—no matching or grading of sections is required. The hard, vitreous surface of Optex glass is highly resistant to wear and offers greater protection against accidental scratching. Its machine-smoothed finish is not injured by washing with water, soap, alcohol or naphtha—even oil paints come off easily with a paint remover. Available in 12-foot lengths, as well as in smaller sections, Optex boards provide a larger unbroken writing area. Clearly visible and permanent rulings can be applied to Optex at the factory.

The back surface of Optex is coated with a special enamel unaffected by moisture, heat, free lime in plaster or frost in brick walls. A special elastic fibrous backing protects the enamel and adapts itself to variations in expansion of glass. The air cushion between the Optex board and the wall insures ventilation and combines with the fibrous backing to deaden noise. Optex will not break unless subject to exceptional shock and, if broken, pieces of glass tend to adhere to the elastic backing.



INSTALLATION DETAILS

Optex blackboards are not cemented to the wall, therefore all finish back of the board can be omitted. Two strips of lumber ½" x 1" are affixed to the wall, *level and plumb*, so that Optex boards may lean against them without undue strain. Where vertical joints are necessary, a zinc "H" joint-moulding is furnished, and a small amount of putty should be placed on the back portion of the board which fits into this section



—otherwise no putty or mastic of any kind should be used. As the zinc section is thicker than the Optex board, the ½" x 1" strips, top and bottom, should be relieved where the joints occur. Opening sizes: Height of board, plus ¾", Length of board, plus 1". Weight is 4.5 lbs. per sq. ft. Optex can be installed easily by carpenters or glaziers at a saving which represents a considerable item in the final cost. Frames and chalk rails to be supplied by others.

SPECIFICATIONS

Wherever blackboards are specified or indicated on the drawings, the contractor shall furnish and install ¼ inch thick Optex glass blackboards as manufactured by the Blue Ridge Glass Corporation, Kingsport, Tenn., and distributed by The Libbey-Owens-Ford Glass Company, Toledo, Ohio.

The color of these boards shall be .....,
(State color desired—black or green.)

Each piece must be marked by the manufacturer with the word "Optex" in the lower left hand corner.

PITTSBURGH PLATE GLASS COMPANY

2153A Grant Bldg., Pittsburgh, Pa.

SELOC

An Ageless Blackboard OF GLASS!

NO more slick, shiny blackboards, where chalk skips and writing is hard to read! No more faded, gray surfaces! No more unpleasant blackboard odors of dissolved glue and chalk ingredients! Seloc, the new blackboard of glass, does away with these results of age and usage.

Seloc is glass into which has been introduced an abrasive and a deep black pigment. Both abrasive and blackness are inherent, extending throughout the body of the glass, and therefore assure a superior, permanently black writing surface, which will never deteriorate no matter how long it is used. Being glass, Seloc will not pit with age, will never require re-grinding to renew its surface, will not absorb either moisture or odors. It can be washed as often as desired.

Further, Seloc is easily installed, in a manner similar to ordinary blackboard materials. Replacement of present boards with Seloc is quick and easy. It has been thoroughly tested in use. And it is available in the standard 42″ height, or, at slight extra cost, in 36″ or 48″ heights, through the warehouses of the Pittsburgh Plate Glass Company. Write for complete information. Pittsburgh Plate Glass Company, 2153A Grant Bldg., Pittsburgh, Pa.

THE STANDARD ELECTRIC TIME COMPANY

Springfield, Mass.

BRANCH OFFICES IN PRINCIPAL CITIES

Manufacturers of

"Standard" Electric Time, Telephone and Fire Alarm Equipment Laboratory Current and Sound Distribution Systems

Master Clock

PROGRAM CLOCKS

For Schools, Industrial Plants, Public and Private Buildings.

"Standard" Electric Time equipment is precision made throughout, absolutely reliable and capable of rendering long service. Standard Master Clocks can be easily and quickly adjusted to meet any program changes that may be required. Program clocks are furnished in either tape or metal disc types. All master clocks are self-winding and built to control as many secondary clocks as are required for any building. Standard automatic hourly correction control assures accurate time in every room, thereby avoiding confusion and delay.

Secondary clocks are obtainable in a wide variety of designs to harmonize with any decorative scheme.

Wall phone with watch case receiver

TELEPHONE SYSTEMS

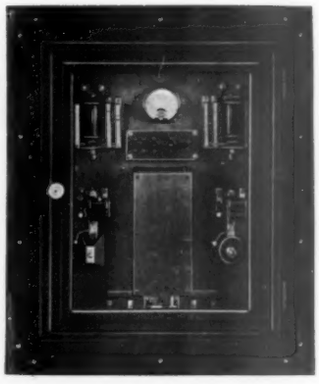
Consist of combination bell control board and central telephone station. Raising of receiver signals office. All conversations may be supervised if desired. May be installed in combination with program bells utilizing same signals and bells.

Dynamic classroom speaker service type with inclined front

RADIO AND PUBLIC ADDRESS SYSTEMS

Complete equipment to meet modern, present day educational requirements. Principals are enabled to broadcast announcements to individual classrooms or to all classrooms simultaneously. Outside radio programs of educational interest may be relayed to any or all rooms. Microphones may be utilized for assembly speakers, etc. A classroom supervising system can also be furnished with Standard Radio Equipment.

FIRE ALARM SYSTEMS



Closed circuit panel and cabinet

All "Standard" Fire Alarm equipment is designed and installed to meet the most exacting requirements and is approved by the National Board of Fire Underwriters. It is available in supervised closed circuit or open circuit types also with coded stations.

Tests can be made readily by opening any station with key. Various types of bell and horn signals are available. Systems may be furnished when so specified to be automatically tested each day from program clocks before the daily school session.

LABORATORY EQUIPMENT

Current Distribution for Physics, Chemistry, Biology, and Shop Departments.

Standard laboratory panels and accessory equipment are available in many designs and types to meet practically all laboratory requirements. The Standard laboratory voltage distribution systems conveniently distribute various voltages to tables and benches and are of inestimable value in every type of school laboratory. Exclusive features include jack construction, perfect contact, colored for ready selection in various voltages, sectional battery charging, and convenient table receptacles.

Wherever Standard laboratory equipment is in use there you will find a greater interest in scientific education on the part of the students.

Laboratory panel equipment with storage battery and motor generator

WARREN TELECHRON COMPANY

Manufacturers of Modern Timekeeping Systems for Modern Schools

*Telechron**

GENERAL OFFICE AND FACTORY
Ashland, Mass.

DISTRIBUTORS AND REPRESENTATIVES IN PRINCIPAL CITIES
In Canada: Canadian General Electric Company, Ltd., Toronto, Ont.

Low Initial Cost—Negligible Operating and Maintenance Costs

Double Face Metal Case Clock for Corridor

Telechron timekeeping equipment for grade schools, high schools, colleges, administration buildings, etc., includes single face clocks for classroom and office use; double face ceiling and wall suspension clocks for corridor use; marble and skeleton types for auditorium and foyer locations; single and multiple circuit program instruments for automatic control of class schedules; signal control boards for individual classroom signal control; classroom buzzers, corridor bells, and yard gongs; outdoor clocks for face of building or tower mounting; and central control equipment of manual or automatic type to permit control of an entire timekeeping installation from one central point.

Program Instrument for Operating Classroom, Corridor and Outdoor Signals

Each Telechron clock is a complete independent timekeeper equipped with a self-starting, sealed in oil, synchronous motor, the speed of which is controlled directly by the frequency of the alternating current to which it is connected. The alternating current frequency is in turn maintained by the aid of a Telechron Master Clock located in the central station of the local power company.

Round Metal Case Clock for Classroom

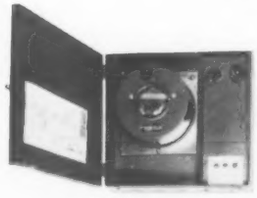
Telechron timekeeping equipment installed with central control may be of 115 volt or 24 volt type, depending on the exact requirements.

Powerful self-starting individual synchronous motor in each timekeeping device prevents scattering, and assures operation regardless of dust, dirt or vibration.

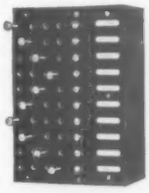
Recommendations to meet your particular requirements can be secured from your local Special Telechron distributor or by writing to the Warren Telechron Company, Ashland, Mass.—No obligation.

Your Architect has Sweet's Architectural Catalog which contains complete specifications

Marble Clock for Auditorium, Foyer, etc.



Automatic Resetting Device for Controlling ADMR (Automatic Dual Motor Resetting) Clock System



Combination Signal Control Board for Individual Classroom Signal Control

Skeleton Clock for Auditorium, Foyer, etc.

TYPICAL INSTALLATIONS

Northville Grade School, Northville, Michigan

Northville Grade School, Northville, Mich., is equipped with a Telechron M.D.M.R. (Manual Dual Motor Resetting) System consisting of 14 indoor clocks, central control equipment and a 72" outdoor clock. (Outdoor clock is separately controlled.) Installed in January, 1937. Architects and engineers, Lyndon and Smith, Detroit, Michigan. Electrical Contractor, Offenstein Electric Co., Detroit, Michigan.

Andrew Jackson High School, Brooklyn, New York

Andrew Jackson High School, Brooklyn, New York, is equipped with a Telechron M.D.M.R. (Manual Dual Motor Resetting) System consisting of 59 indoor clocks, program instrument, and central control equipment. Installed in April, 1937. Architects, W. C. Martin, Brooklyn, N. Y., and New York Board of Education. Engineers, New York Board of Education, Brooklyn, N. Y. Electrical Contractors, Jandous Electric Equipment Co., New York City.

* *Telechron is the trade-mark, registered in U. S. Patent Office, of Warren Telechron Company.*

THE GAMEWELL COMPANY

Newton Upper Falls, Massachusetts

BRANCH OFFICES

New York	Atlanta	Chicago	Denver	Los Angeles
Chicago	Pittsburgh	Dallas	Detroit	Montreal, Canada

FIFTY SCHOOL FIRE DISASTERS SINCE 1900
Involving Loss of More Than 400 Lives

"The public apathy is such that a holocaust involving loss of life creates only a momentary sensation of horror which is soon forgotten."

A fire alarm system, constantly and automatically supervised, which transmits the alarm instantly and directly to the fire department and at the same time provides for the orderly evacuation of the building is essential to protection of life and property.

The Gamewell Company, pioneers in the art of fire alarm telegraphy since its inception, has specialized in the development, manufacture and installation of fire alarm and other emergency signaling systems for municipalities, schools, institutions and industrial properties. Gamewell systems are now in service in all parts of the civilized world, including some two thousand municipalities and several thousand schools, institutions and commercial establishments.

In Gamewell fire alarm systems are incorporated the net results of an unequaled experience of seventy years in this field.

Master Fire Alarm Box City Type—Surface Mounting

There are three types of fire alarm systems:

1. **The Dualarm System**—for smaller schools and institutions—directly connected with the municipal fire department where such connections are available. Local battery power not required.
2. **Proprietary Systems**—for colleges and institutions of sufficient size to warrant the installation of a complete signaling system, each including a central operating and supervising station at the protected property.
3. **Exit-Alarm Systems**—efficient, simple and inexpensive for schools, dormitories, fraternity houses, residences, etc., where connections with municipal fire departments are not available.

THE GAMEWELL DUALARM SYSTEM

The Gamewell Dualarm System simultaneously calls the fire department and sounds a local exit alarm throughout the building so that occupants may leave or be assisted therefrom in an orderly manner.

Fire drills for instructing the pupils in proper procedure in case of fire may be initiated by this system. For fire drills, the local alarms only are sounded, no alarm being sent to the fire department.

GAMEWELL PROPRIETARY FIRE ALARM SYSTEMS

The Proprietary system includes facilities for . . . directing the local fire brigade to the scene of fire . . . calling the municipal fire department . . . automatically closing fire doors and operating water and foam deluge sets—if any—in the affected areas. . . . All as the result of the manual operation of a fire alarm box or the automatic operation of a fire detector.

Gamewell fire alarm systems are efficient, reliable, as durable as the buildings themselves, assure continuity of institutional operation and constitute a permanent investment in safety to buildings and occupants.

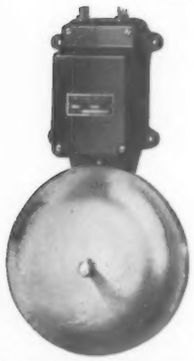
Write for complete descriptive catalog. Surveys and estimates freely furnished

THE THOMAS-SMITH COMPANY

Canton, Ohio

BRANCHES IN PRINCIPAL CITIES

Electrically and Mechanically Operated Fire Alarm Systems
Electric Bells and Signals



Liberty Vibrating Bells Are of the Plunger Hammer Type. Nos. 6-Jr. D. C. and 7-Jr. A. C. Are Made in 3″, 4″, 5″ and 6″ Sizes, and Nos. 6 D. C. and 7 A. C. in 6″, 8″, 10″, 12″ and 14″ Sizes

Nos. 86 D. C. and 87 A. C. Combination Vibrating and Mechanical Bells Are Especially Adapted for Fire Signals. They Are Made in 8″, 10″ and 12″ Sizes

Nos. 811 D. C. and 812 A. C. Combination Single Stroke and Mechanical Bells Are Also Adapted for Fire Signals. They Are Made in 6″, 8″, 10″ and 12″ Sizes

PRODUCTS

Manually Operated Fire Alarm Systems;

Electrically and Mechanically Operated Fire Alarm Systems;

Vibrating and Single Stroke Bells for Direct or Alternating Current;

Combination Electrical and Mechanical Bells;

Aluminum Grids to fit all sizes of Bells;

Steel Housings for all sizes of Bells.

THOMAS-SMITH FIRE ALARM SYSTEM FOR SCHOOLS

(Illustrated at Right)

This manual fire alarm system for schools is approved by architects and conforms with state codes. It is the only system having a rigid rod connecting the alarms on the different floors of the school buildings. Other constructive features are:

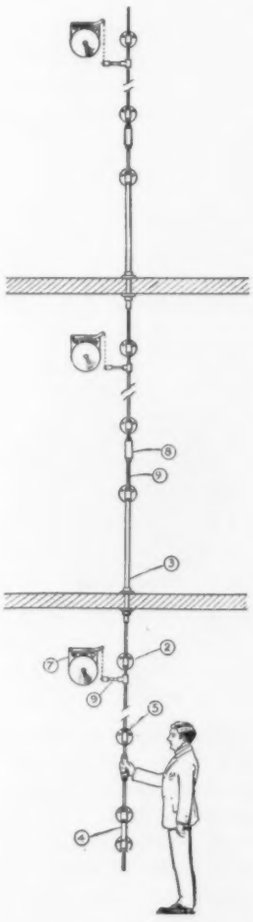
1. Supports are adjustable to take care of uneven walls or misalignment of succeeding floors.
2. The floor tube is adjustable, to allow for floors of various thicknesses, and it extends up from the floor to prevent any obstruction in operation.
3. The spring is totally enclosed and positive in action.
4. All supports and tubes are bushed with brass, lacquered.
5. Finish is enamel. Colors, red, black or buff.
6. The bells are the best made.
7. The handles are of polished brass, lacquered.
8. The operating rod is a continuous steel tube, operating gongs on all floors simultaneously.
9. Wood mats are supplied for mounting supports and gongs.

Combination electrical and mechanical bells can be furnished with above fire alarm systems for operation with electrical ringing systems.

THOMAS-SMITH LIBERTY BELLS

Thomas-Smith Liberty Bells cover all types and sizes from 4-inch to 20-inch, vibrating or single stroke, 110 volt, 220 volt, all standard transformer voltages, battery operations, direct or alternating current. All Thomas-Smith Liberty Bells embody the very finest workmanship and materials. Thomas-Smith Aluminum Grids are made to fit all sizes of bells. They fit snugly at the base of the mechanism over the shell and are bird-proof.

Write for catalog of Thomas-Smith Fire Alarm Systems and Liberty Bells.



Liberty Single Stroke Bells, Nos. 12 A. C. and 11 D. C. Made in 5″ to 14″ Sizes. Bells Contain no Springs Nor Moving Parts Except Plunger

AMERICAN DISTRICT TELEGRAPH COMPANY

A.D.T. PROTECTION SYSTEMS
155 Sixth Avenue, New York City
CENTRAL STATION OFFICES IN ALL PRINCIPAL CITIES

Automatic Fire Detecting and Reporting Systems
Manual Fire Alarm and Signaling Systems

THE AMERICAN DISTRICT TELEGRAPH COMPANY, founded in 1873, is a nation-wide organization whose sole business is the manufacture, installation, maintenance and operation of electric protection systems. The A.D.T. fire protection systems described below are operated with Central Station Service, with Direct-to-Fire Department connection, or as Local Alarm Systems.

Central Station Service: The protection system at the subscriber's premises is electrically connected to the A.D.T. Central Station, where the alarm is immediately transmitted by direct wire to the fire department, and is also acted upon by A.D.T. emergency patrol forces. This service provides continuous electrical supervision, inspections and maintenance of the system by A.D.T. Available in more than 350 cities.

Direct-to-Fire Department Service: Where Central Station Service is not available, the system may be connected by direct, private wire to the local fire department, where suitable devices are installed for receiving alarms. Arrangements may be made with A.D.T. for periodic inspections, tests and other services.

Local Alarm Systems: Include equipment for giving the alarm locally by means of audible and visual signals. Provide for owner operation and maintenance, although when necessary, arrangements may be made with A.D.T. for periodic inspection, tests and other services. Available everywhere.

Mitchell School, one of eleven public schools in Charleston, South Carolina, protected by the Aero Automatic Fire Alarm System

AERO AUTOMATIC FIRE ALARM SYSTEM

This system, as its name implies, detects fire automatically, and (when such service is provided for, as explained above) automatically summons the fire department, as well as giving audible or visual warning signals on the premises. Aero is a combined pneumatic and electrical system which operates on the rate of temperature rise. The pneumatic part of the system consists of inconspicuous copper tubing, 1/12 in. diameter, run in loops or circuits along the ceiling or under the roof. Both ends of each tube circuit terminate in small metal chambers formed by expansible metal diaphragms of the aneroid barometer type. The rapid rise in temperature caused by a fire condition results in increased pressure within the tubing, which bulges the diaphragms, thereby making an electrical contact which results in an alarm. An annunciator shows the section of the building where the alarm originated.

Aero Detector Unit, with break-glass rod for manual operation. At right, Aero Annunciator

Fire protection engineers recognize this type of system—(operating on the **rate of temperature rise** rather than upon the attainment of any predetermined dangerously high temperature)—as assuring the fastest possible detection of fire.

While a complete Aero installation throughout a building is, of course, the ideal protection, this sometimes may not be feasible. In such cases, a partial installation covering only the areas of excessive hazard will often reduce the danger of serious fire to a point very close to the minimum.

The Aero system, by detecting the fire in its earliest stage, makes extinguishment possible with the minimum attendant damage. So speedy is the Aero system in detecting and reporting fire that a chemical hand extinguisher frequently suffices to extinguish the blaze.

Installation, Maintenance and Cost

No capital investment is required for the installation of an Aero system. The equipment is installed by A.D.T. engineers, and the service is rendered on a contract basis.

Installation of the equipment need not interfere with normal activities in the building. The inconspicuous tubing can be installed on the ceiling or walls in such a manner as not to mar the decorative scheme. The system is fully self restoring, i.e., no replacements of equipment are necessary after the system has operated.

The system can be tested whenever desired by introducing pressure into the tubing to simulate a fire condition.

Manual Fire Alarm boxes also are installed in association with the Aero System.

Write for descriptive booklet giving complete details.

SPRINKLER SUPERVISORY AND WATER-FLOW ALARM SERVICE

This service, for premises protected by automatic sprinkler systems:

(a) Makes the sprinkler system function as an automatic fire alarm, summoning the fire department automatically the instant a sprinkler head operates, or in case of a serious leak.

(b) Maintains a continuous, electrical watch over all vital parts of the sprinkler system. Any trouble condition which might impair the supply of water or its proper and effective distribution, is automatically detected and reported to the A.D.T. Central Station, which takes immediate corrective action.

Booklet describing A.D.T. Sprinkler Supervisory and Waterflow Alarm Service are available on request.

A.D.T. MANUAL FIRE ALARM AND SIGNALING SYSTEMS

Manual Fire Alarm Systems include the necessary equipment to enable the discoverer of a fire to give warnings locally and to summon assistance by manually operating a fire alarm box.

Manual Fire Alarm Systems are of two main types: coded and non-coded.

Coded Fire Alarm Systems—The coded system gives a distinctive signal on a system of bells or other signaling devices, indicating the location in the building of the box operated. When a number of buildings are to be protected, coded fire alarm systems can be furnished with **Group Control** to give an alarm at one or more points in all buildings.

Non-Coded Fire Alarm Systems—The non-coded system gives a continuous alarm on the bells or other signaling devices to warn the occupants of the building, but does not sound a code to indicate the location of the fire alarm box that has been operated.

Fire Alarm Box for Non-Coded Systems

Fire Alarm Boxes—For coded systems, boxes are furnished either with spring door or break-glass door, as illustrated. The alarm is sounded by pulling a lever inside the box. For non-coded systems, in most cases, boxes are of the break-glass door type, in which breaking a glass panel or rod results in the continuous ringing of the alarm bells. Fire alarm boxes are supplied for either flush or surface mounting.

Fire Alarm Box, Spring Door Type, for Coded Systems

Fire Alarm Box, with Break-Glass Door, for Coded Systems

Fire Alarm Bells—Single-stroke bells are used in most coded systems. The underdome type illustrated, includes a special hot pressed alloy steel gong with black rust-resisting finish. All mechanism is concealed under the bell shell. Vibrating bells are supplied for most non-coded systems. When desired, horns or other audible signals can be furnished.

Fire Alarm Bell, Vibrating Type, for Non-Coded Systems

Fire Alarm Bell, Single Stroke Type, for Coded Systems

Connection to A.D.T. Central Station and Fire Department—Where A.D.T. Central Station Service is available, A.D.T. fire alarm systems may be connected to an A.D.T. Central Station which summons the fire department directly to the location of the box operated. (For description of Central Station Service see opposite page.) Where Central Station Service is not available, connection may be made direct to the fire department.

Installation and Maintenance—The A.D.T. Manual Fire Alarm Systems described above may be purchased direct from the company or through electrical contractors. When A.D.T. Central Station Service is desired arrangements must be made with a company representative who will call upon request.

Write for descriptive booklets giving complete details.

A.D.T. WATCHMAN'S COMPULSORY TOUR SYSTEM

For schools employing watchmen. Maintains constant check on watchman's performance and investigates immediately if watchman fails to signal the A.D.T. Central Station. Summons emergency aid in case of illness, accident or attack by intruders. This system may be installed in conjunction with A.D.T. Manual Fire Alarm Service.

A.D.T. Central Stations are located in all principal cities of the United States. They operate under the name "American District Telegraph Company," with the following exceptions: CHICAGO AND ELSEWHERE IN ILLINOIS, Illinois District Telegraph Co.; CINCINNATI, OHIO, Ohio Messenger & Telegraph Co.; DETROIT, MICHIGAN, The American Still Alarm; LOUISVILLE, KY., American Protection Co.; PHILADELPHIA, PA., Philadelphia Local Telegraph Company; CITIES IN THE STATE OF NEW JERSEY, American District Telegraph & Messenger Co.

THE ELECTRIC STORAGE BATTERY COMPANY

World's Largest Manufacturers of Storage Batteries for Every Purpose

Allegheny Avenue and Nineteenth Street, Philadelphia, Pa.

WHY

emergency lighting is necessary

Lighting Failures Do Happen—Storms, fires, street accidents, floods, blown fuses, short circuits—*all events which electric companies are helpless to foresee or prevent*—do cause electric lighting interruptions.

No Community or Building Immune—Electric service interruptions occur without warning, when least expected and where least wanted. An auditorium or gymnasium crowded with pupils at sports, plays, lectures or dances, is no place to gamble with the risks of fire, injury or damage which frequently attend sudden darkness.

Such Risks Unnecessary—Today, emergency lighting can be provided for the vital parts of any school building by installing Exide Keepalite. During an electric service interruption, Exide Keepalite furnishes the power from a dependable Exide Battery to the lights in auditoriums, gymnasiums, corridors, exits, fire towers, stairways, engine rooms, locker rooms, swimming pools, dormitories, laboratories, etc.

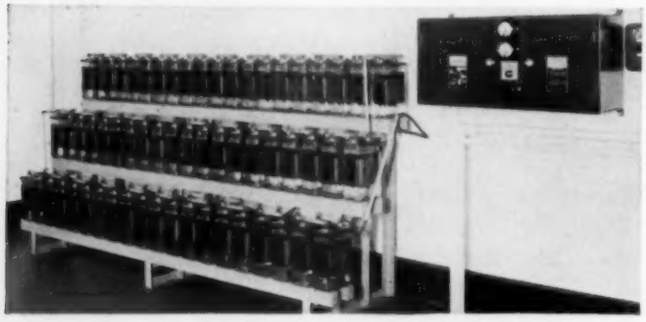
Automatic Protection—Exide Keepalite Emergency Lighting Battery Systems are completely automatic and instantaneous in operation.

A Battery System—Electrical engineers agree that a storage battery, *properly maintained*, constitutes the most dependable source of emergency power. Exide Keepalite Systems assure this form of protection at a maintenance cost as low as 1½¢ a day for power.

Exide Batteries have been used in emergency service, by telephone, railroad and public utility companies since 1895. The new Exide Keepalite control equipment, which automatically keeps the battery properly maintained, represents the specifications found desirable from the experience of more than 2000 installations in all kinds of buildings.

For Any Size Installation—In order to economically meet the widely varying requirements of individual school buildings, 115 volt and 12 volt Exide Keepalite Systems are available. The important electrical circuits of entire buildings can be protected with the larger 115 volt systems; or, parts of buildings can be adequately safeguarded with the specially designed low voltage Exide Keepalite Systems. Depending upon the amount of protection desired, Exide Keepalite Systems can be had for $150.00 and up.

A Typical Exide Keepalite System with a 60-cell Exide Battery and a 30 Amp. Control Unit. It Operates Instantly and Automatically. The Infrequent Addition of Water to the Battery Is the Only Maintenance Required



Exide Keepalite

EMERGENCY LIGHTING BATTERY SYSTEMS

How Keepalite Works

115 Volt System—This system provides all of the control apparatus necessary to: (1) automatically transfer the emergency circuits (regular building circuits) to the battery in a split-second—whenever normal electric service fails; (2) automatically return the emergency circuits to the normal electric supply—when it has been restored; (3) automatically recharge the battery; (4) automatically keep the battery charged at all times; and (5) automatically give an alarm if anything should go wrong with any part of the Exide Keepalite equipment.

12 Volt System—This system employs its own low voltage wiring circuits to the areas within a building needing protection. Through the use of special high-efficiency lamps (which give more than twice the lumins of ordinary electric bulbs) it provides adequate emergency lighting over floor areas, totaling 10,000 square feet. This equipment consists of especially designed apparatus to: (1) automatically provide emergency lighting in a split-second after an interruption of normal service; (2) automatically go off when normal service is restored; and (3) automatically place battery on trickle charge. However, provision is made that (a) the battery can be charged at a high rate by merely flipping a switch; and (b) the working order of the equipment can be tested by pushing a button. Thus it can be seen that only the minimum amount of attention is required. Any pupil could operate an Exide Keepalite low voltage system.

All smaller buildings, or parts of larger buildings, can be protected with the new, low cost equipment. However, in larger buildings where complete lighting protection is required, naturally the larger 115-volt Exide Keepalite System should be installed. The low voltage Exide Keepalite is not a substitute for the larger systems. It was designed to afford protection for areas limited to 10,000 square feet.

This $150.00 Exide Keepalite Protects Lighting of Areas Up to 10,000 Sq. Ft. It Operates Instantly and Automatically

Superiority of Storage Battery Emergency Lighting Systems—Exide Batteries have long been used in not only emergency lighting service but also emergency power service. They safeguard the operation of railroad switches and signals, fire alarms, telephone, marine radio, industrial processes, etc.

Battery Life—More Than 10 Years—Exide Chloride Batteries used with Exide Keepalite Systems are good for 10 or more years of service.

THE ELECTRIC STORAGE BATTERY COMPANY offers the services of its trained Engineering Department to assist architects in the planning of a trouble-free Emergency Lighting System. We will be glad to send you complete descriptive literature and specifications for every type of Exide Keepalite Emergency Lighting Battery System.

Dependable Exide Laboratory Batteries available in any size, See page 544

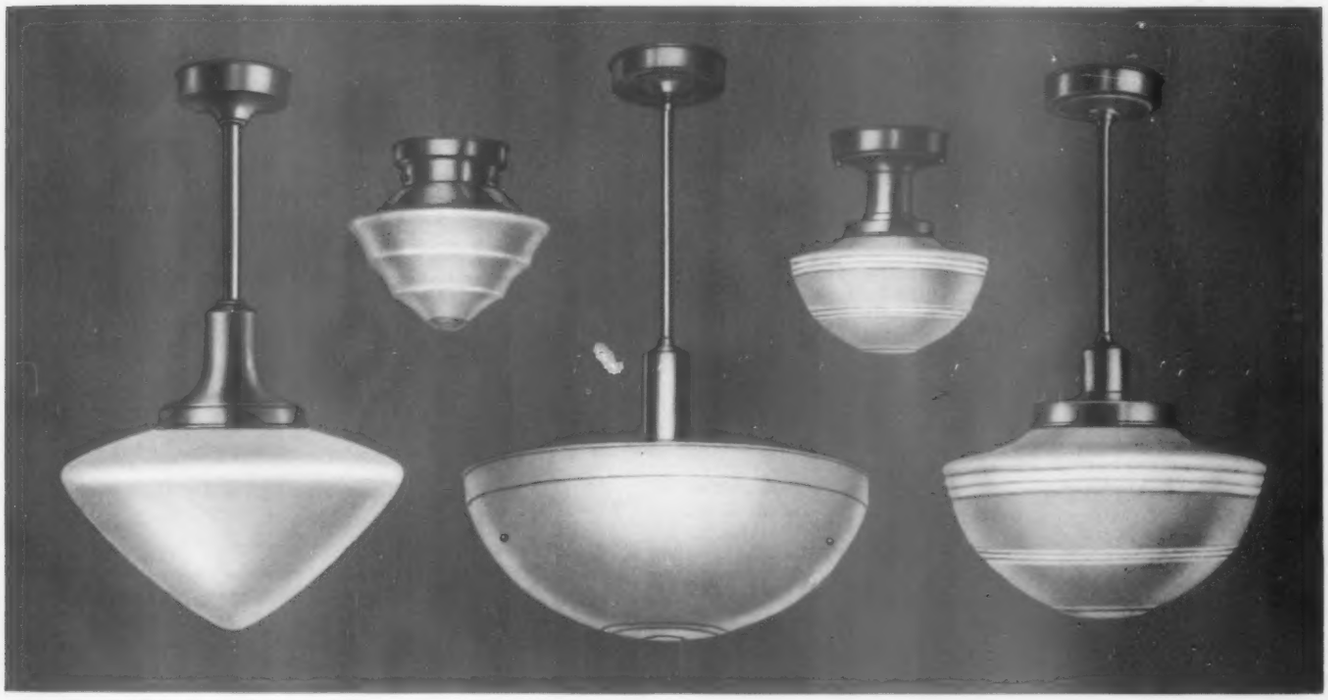
CHASE BRASS & COPPER CO.

—INCORPORATED—

Subsidiary of Kennecott Copper Corporation

Lighting Fixture Division • Dept. ASI • Waterbury, Conn.

SCHOOL LIGHTING *by Chase*



CHASE SCHOOL FIXTURES

ARE DESIGNED AND ENGINEERED TO—

1. Give maximum light output and light distribution.
2. Give more safety to pupils by eliminating falling globes due to movable parts which become loosened.
3. Simplify mechanical construction, so that either glass or plastic bowls can be easily and quickly removed for relamping or cleaning.
4. Retain their beautiful chromium finish which is plated over rust-proof Chase brass.

Chase Semi-Indirect lighting is produced with Plastic Bowls. Plastic bowls are much lighter in weight than glass, they will stand more rough usage than glass and when properly installed, changes in temperature do not cause them to crack or break. Their light output is equal to the best grade of glass or metal.

Chase Semi-Indirect fixtures give uniform lighting. Only enough light is filtered through the bowl to blend with the reflected light from the ceiling. This eliminates bright and dark areas, and is restful and comfortable to the eyes.

Chase Enclosing Globe fixtures have safety type features. The glass globes are locked securely on the hangers without the use of screws.

Complete catalogs and specifications sent on request.

CORNING GLASS WORKS

718 Fifth Avenue
New York

Corning, New York

159 West Lake Street
Chicago

SCHOOL LIGHTING

Though most school work is done during the day there are cloudy days which necessitate more light.

In a recent investigation of pupils retarded a year or more in their classes, 67% had defective eye-sight. Good lighting insures against eyestrain and resulting fatigue.

The average cost for school operation in the United States is over $80.00 per pupil per year. To adequately illuminate the average school room, the cost is less than $80.00 per year. The cost of good lighting would be entirely absorbed by the effected saving if only a relatively small percentage of the six million pupils who have been retarded a year or more in school work, could be advanced with their regular classes.

Inefficient luminaires can be expensive, despite low cost. Inefficient luminaires either absorb too much light, resulting in eyestrain and costly failures, or the inefficient luminaire requires a larger amount of electrical energy to produce adequate illumination resulting in higher current cost. Good quality, white diffusing glassware, either of the semi-direct or the semi-indirect enclosing globe type, has long been recognized as ideal for class room illumination. To differentiate between quality glass and a cheap product, insist that each globe be tested under identical conditions. The illuminating Engineering Society has set up a standard test for lighting glassware. This test is impartial and all glass submitted for a school lighting project should be considered only if accompanied by an analysis prepared under this test. All standard Macbeth globes have been tested under these specifications and data are readily available.

The I E S Testing Specification does not set any standards for the quality of a lighting unit. It only reports the performance of any manufacturer's product. It provides an excellent basis for the school engineer or architect to determine a minimum acceptable standard specification which will insure quality lighting equipment in the school. Many such specifications are in use today, all based on the I E S Testing Specification. MONAX and GALAX enclosing globes have found satisfactory service in thousands of schools throughout the country.

LAYOUT OF CLASSROOM LIGHTING

This recommendation does not include either location of all classroom lighting units or wiring specifications. Simple rules can be given which will guide in schoolroom lighting.

Spacing between outlets should not exceed 1½ times the distance from the working plane to the lighting source. Spacing between the outlets and the wall should be approximately ½ the spacing between outlets.

More uniform illumination is obtained if semi-direct lighting enclosing globes are mounted as close to the ceiling as design permits. This high mounting also tends to remove the globes from the line of vision and hence improves seeing ability.

Semi-indirect lighting u n i t s should be suspended from the ceiling at a distance sufficient to illuminate the ceiling without causing spots of high brightness above the units. A suspension distance of ⅕-¼ the ceiling height is usually satisfactory.

The wattage needed for each lighting unit is governed by the illumination desired in the classroom and by room conditions, such as the color of the ceiling and walls and the dimensions of the room. Seats farthest from windows require more artificial illumination than those nearby. In the fixtures used to illuminate such seats, it is good practice to install lamps of the next higher wattage than those used nearer the windows. The rough rule that, 1 watt per square foot will produce about 5 foot candles under favorable conditions with quality equipment, can be applied to classroom lighting, if used cautiously.

SUGGESTED SPECIFICATION FOR SEMI-INDIRECT ENCLOSING GLOBES

For use in all classrooms where the seeing task is severe and where a good highly reflecting ceiling permits their use.

Material

The glass shall be of the best quality, uni-layer homogeneous character, free from streaks, cords and blisters which would detract from the appearance of the unit, shall be mechanically strong and well annealed. The globe shall be totally enclosing except for the fitter opening and constructed in such a manner that the bottom of the globe is of a dense white highly reflecting character causing a major portion of the light emitted by the lamp to be reflected upward according to the semi-indirect lighting principle, while the upper portion of the globe is of a slightly diffusing character permitting a large percentage of the light to be transmitted upward. The fitter edge of the globe shall have a fire polished finish. Each globe shall be stamped with the name of the manufacturer.

Size and Shape

The shape shall conform to that shown on the accompanying illustration. The globes shall conform to the following schedule of sizes for respective wattages.

Lamp Size	Globe Diameter
100 W	10″
150 W	12″
200 W	14″
300 W	16″
500 W	18″
750 W	20″

Photometric Characteristics

The bidder shall submit data showing results of photometric tests on the glass globes which he proposes to supply. The photometric analysis shall be made by a competent testing laboratory according to the provisions of the "I E S Specifications for Testing Diffusing Type Enclosing Glassware."

To be acceptable the product must show an overall efficiency of not less than 72% with not more than 25% of the light output of the bare lamp in the 0-90° zone. The maximum surface brightness at any point in the line of vision shall not exceed 3 candles per square inch.

Inspection and Approval

The successful bidder shall submit a sample, or samples of the luminaire to the engineer's (or architect's) office together with the photometric data, for approval before executing the order. All globes and fixtures delivered for this installation will be subject to inspection by a representative of the engineer's (or architect's) office. Failure to conform with the above specification in any way shall be sufficient reason for rejection.

CORNING
means
Research in Glass

SUGGESTED SPECIFICATION FOR SEMI-DIRECT ENCLOSING GLOBES

(White Diffusing Glassware)

Glassware to be furnished on this installation shall be MONAX (name of globe) globe or equal to be approved by the architect.

Enclosing globes shall be in accordance with the schedule of sizes.

Lamp	Minimum Diameter of Globe	Fitter	Lamp	Minimum Diameter of Globe	Fitter
100 watt	12″	4″	300 watt	18″	6″
150 watt	14″	6″	500 watt	20″	8″
200 watt	16″	6″	750 watt	20″	8″

All glassware shall be homogeneous in texture, shall be uniform in quality, shall be free from objectionable imperfections such as streaks, cords, stones, blisters, etc.; shall be of sufficient weight and uniform thickness so as to have mechanical strength and shall be properly annealed. The light output of the globe shall not be less than 82% and the maximum surface brightness of the globe shall not exceed 3 candles per square inch when tested in accordance with the above schedule of lamp with globe sizes. The fitter edge of the globe shall have a fire polished finish. Each globe shall be stamped with the name of the manufacturer.

Before executing the order the successful bidder shall submit a sample or samples of the luminaire to the engineer's (or architect's) office together with photometric data showing results of tests on the glass globes which he proposes to supply. These photometric analyses shall be made by a competent testing laboratory according to the provision of the "I E S Specifications for Testing Diffusing Type Enclosing Glassware." All globes and fixtures delivered for this installation will be subject to inspection by a representative of the engineer's (or architect's) office. Failure to conform with the above specifications in any way shall be sufficient reason for rejection.

SIMPLIFIED ILLUMINATION CALCULATION PROCEDURE

First—Determine foot-candles required from Table 1.

Second—Determine "Condition Factor" for the interior whether "Favorable," "Average" or "Unfavorable." The "Conditions Factor" will depend upon the room proportions, color of ceiling and upper walls, and the maintenance of equipment. Typical "Average Conditions Factor" consists of—

Room proportions
Width approximately twice ceiling height
Color of ceiling and walls —Medium
Maintenance of equipment —Fair

The "Condition Factor" becomes more "Favorable" as the width of the interior increases in proportion to its height; as the color of ceiling and upper walls become lighter; and as the maintenance of equipment improves.

Third—Decide which type of illuminating glassware (Monax or Galax or Denax) is desired.

Fourth—Decide mounting height. Ordinarily, an overall fixture length (ceiling to underside of enclosing globe) of one-fourth ceiling height may be used. Ceiling type fitters should be used on low ceilings.

Fifth—Locate in first column, Table 2, the contemplated "Area per Outlet" or Approximate Spacing and further narrow this down to the "Condition Factor" determined in second step. Then traverse Table 2 horizontally to the right until the desired foot-candle intensity (as determined in first step) is located in the correct glassware section. If not so found, then go to a closer spacing until desired foot-candle intensity is located. Directly above in the column heading is the required lamp size.

TABLE No. 1

Recommended Standards for Good Illumination for Schools

	*Range		*Range
Classrooms		Laboratories	20-10
(On Desks and		Auditoriums	8-4
Blackboards)	20-10	Assembly Rooms	8-4
Study Halls	20-10	Cafeterias	8-4
Libraries	20-10	Locker Rooms	4-2
Sewing Rooms	30-15	Corridors, etc.	4-2
Drafting Rooms	30-15	Sight Saving	
Art Rooms	30-15	Classrooms	40-25
Shops	20-10	Gymnasiums	20-10

* Range is given in order to take into account differences in school systems regarding the severity of visual tasks.

TABLE 2

AVERAGE FOOT CANDLES

Area Per Outlet or Approximate Spacing	Condition of Room For Good Lighting	MONAX Semi-Direct Lighting Globes				GALAX Semi-Indirect Lighting Globes				DENAX Luminous Indirect Lighting Globes				
										16″ Bowl		18″ Bowl		22″
		150 Lamp 14″ Globe	200 Lamp 16″ Globe	300 Lamp 18″ Globe	500 Lamp 20″ Globe	150 Lamp 12″ Globe	200 Lamp 14″ Globe	300 Lamp 16″ Globe	500 Lamp 18″ Globe	150 Watt Lamp	200 Watt Lamp	300 Watt Lamp	500 Watt Lamp	750 Watt Lamp
85-95 Sq. Ft. or 9½′ x 9½′ Spacing	Favorable	9-12	12-16	19-27	31-43	7-10	10-14	16-22	25-36	7-10	10-14	16-22	25-36	37-50
	Average	6-8	8-11	13-18	20-31	5-7	6-9	11-16	16-24	5-7	6-9	11-16	16-24	24-37
	Unfavorable	4-6	5-7	8-12	13-20	3-4	4-5	7-11	10-15	3-4	4-5	7-11	10-15	16-24
95-110 Sq. Ft. or 10′ x 10′ Spacing	Favorable	8-10	10-14	17-23	29-37	6-9	9-12	15-20	23-33	6-9	9-12	15-20	23-33	34-46
	Average	6-8	7-9	11-16	20-28	4-6	6-8	9-14	15-23	4-6	6-8	9-14	15-23	22-34
	Unfavorable	3-5	4-6	7-10	13-20	2-4	3-5	6-9	9-14	2-4	3-5	6-9	9-14	15-22
110-125 Sq. Ft. or 11′ x 11′ Spacing	Favorable	7-9	9-12	15-20	25-34	5-7	8-11	13-18	20-30	5-7	8-11	13-18	20-30	30-40
	Average	4.5-6	6-8	9-14	18-24	4-5	5-7	9-12	13-20	4-5	5-7	9-12	13-20	19-30
	Unfavorable	3-4	4-6	6-9	11-17		2-4	6-9	9-12		2-4	6-9	9-12	13-19
125-145 Sq. Ft. or 11½′ x 11½′ Spacing	Favorable	5.5-8	8-11	13-17	22-30	5-6	7-9	11-16	18-26	5-6	7-9	11-16	18-26	25-34
	Average	4-5	5.5-7	8-12	14-21	3-5	4-6	7-10	12-18	3-5	4-6	7-10	12-18	16-25
	Unfavorable		4-5	5-8	9-14		2.0-3	5-7	8-11		2-3	5-7	8-11	12-16
145-170 Sq. Ft. or 12½′ x 12½′ Spacing	Favorable	5-6	7-10	10-15	19-25	3.5-5	6-8	9-13	17-24	3.5-5	6-7	9-13	17-24	22-30
	Average	3-4	5-7	7-10	13-18	2-3	3-5	6-9	11-17	2-3	3-5	6-9	11-17	13-22
	Unfavorable		3.5-5	5-7	8-12		2-3	4-6	7-11		2-3	4-6	7-11	9-13
170-200 Sq. Ft. or 13½′ x 13½′ Spacing	Favorable		6-8	9-12	17-22	750 W	5-6	8-11	14-19		5-6	8-11	14-19	18-25
	Average		4-6	6-9	11-16	*Lamp 20″	3-4	5-8	9-14		3-4	5-8	9-14	12-18
	Unfavorable		3-4	4-6	7-10	Globe	2-3	3-5	6-9		2-3	3-5	6-9	8-12
200-230 Sq. Ft. or 14¾′ x 14¾′ Spacing	Favorable		5-6	8-11	14-20	18-23	4-5	7-10	12-16		4-5	7-10	12-16	15-23
	Average		3-5	5-8	9-13	11-16	3-4	4-7	8-12		3-4	4-7	8-12	10-15
	Unfavorable		2.5-3	3.5-5	6-9	7-10	2.0-3	3-4	5-8		2-3	3-4	5-8	7-10
230-260 Sq. Ft. or 15½′ x 15½′ Spacing	Favorable		4-5.5	7-10	12-17	15-21	3.5-4	6-8	10-14		3-4	6-8	10-14	15-21
	Average		3-4	5-7	9-11	10-15	3.0-3.5	4-6	7-10		2-3	4-6	7-10	9-14
	Unfavorable		2-3	3-5	6-8	7-10		2-4	4-7			2-4	4-7	6-9
260-300 Sq. Ft. or 16¾′ x 16¾′ Spacing	Favorable		3.5-5	6-8	11-15	13-18	3-4	5-7	9-12		2-4	5-7	9-12	12-18
	Average		3.0-3.5	4-5	7-10	e-13		3-5	5-8			3-5	5-8	9-12
	Unfavorable			3-4	5-7	5-8		2-3	3-5			2-3	3-5	5-8
300-340 Sq. Ft. or 18′ x 18′ Spacing	Favorable			5-7	10-13	12-14		4-6	8-11			4-6	8-11	10-14
	Average			3.5-4	6.5-9.5	7-11		3-4	5-8			3-4	5-8	7-10
	Unfavorable			2.5-3	4-6.5	4-7			3-5				3-5	4-7

* Figures given are for MONAX Semi-Direct Lighting. Decrease by 5% for GALAX Semi-Indirect Lighting.

MONAX and GALAX enclosing globes have given good illumination and satisfactory service in thousands of schools throughout the country. The following pages illustrate glass for school lighting.

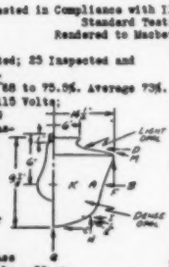
ELECTRICAL TESTING LABORATORIES
NEW YORK, N. Y.

REPORT NO. 134591 ORDER NO. 57611-S PLATE NO. 27857

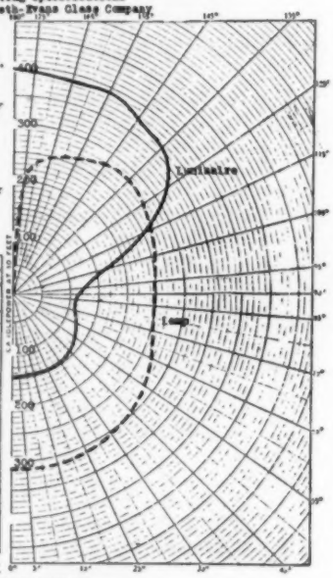
CANDLEPOWER DISTRIBUTION
NO. 12011 GALAX GLOBE

Tested in Compliance with Illuminating Engineering Society Standard Testing Specifications
Rendered to Macbeth-Evans Glass Company

Globes - 40 Submitted; 25 Inspected and Weighed; 6 Tested.
Light output range 68 to 75.8%. Average 73%.
Lamp - 200 Watts; 115 Volts; 3400 Lumens; PS30 Inside Frosted Gas-Filled Bulb; C-9 Filament; Medium Base; General Service.
Surface covering globe opening, reflection factor 0.40.



White Diffusing Glass
Weight of test sample - 80 oz.



LUMINAIRE DISTRIBUTION DATA
MEAN VERTICAL

MID-ZONE ANGLES	CANDLEPOWER AT 10 FEET	ZONAL LUMENS	MID-ZONE ANGLES	CANDLEPOWER AT 10 FEET	ZONAL LUMENS
180° UP	396		90° HOR.	112	
175°	392	37	85°	106	118
165°	388	109	75°	112	119
155°	391	160	65°	122	121
145°	372	235	55°	133	119
135°	364	280	45°	142	110
125°	325	298	35°	146	92
115°	248	244	25°	148	69
105°	165	173	15°	148	42
95°	122	133	5°	148	14
			0° HOR.	148	

LIGHT FLUX VALUES

ZONE	LUMENS LAMP	LUMENS LUMINAIRE	PER CENT TOTAL LUMENS EACH LAMP	PER CENT LIGHT OUTPUT
0°-60°	934	448	13	73
0°-90°	1742	904	25.9	
90°-180°	1656	1683	49.3	
0°-180°	3398	2467	73	

LUMINAIRE BRIGHTNESS

CANDLEPOWER PER SQUARE INCH
THE ARROWS INDICATE THE LOCATION AND ANGLE OF VIEW

LOCATIONS	A	B	C	D	E	F	G	H	I	J	K	L	M
CP PER SQ. IN.	1.0	1.0	1.1	3.5	1.3	0.7	1.1	1.2	1.2		1.1	1.2	1.7

TESTED BY [illegible] PLOTTED BY [illegible] COMPUTED BY [illegible] CHECKED BY [illegible] ISSUED February 28th, 1935

*E.T.L. Identification No. 5305

APPROVED BY
William F. Kiesel
ENGINEER IN CHARGE OF PHOTOMETRY

C. E. Howe
IN CHARGE OF TEST

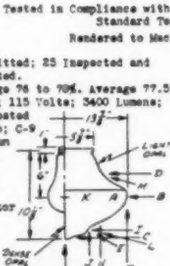
ELECTRICAL TESTING LABORATORIES
NEW YORK, N. Y.

REPORT NO. 134590 ORDER NO. 57611-S PLATE NO. 27856

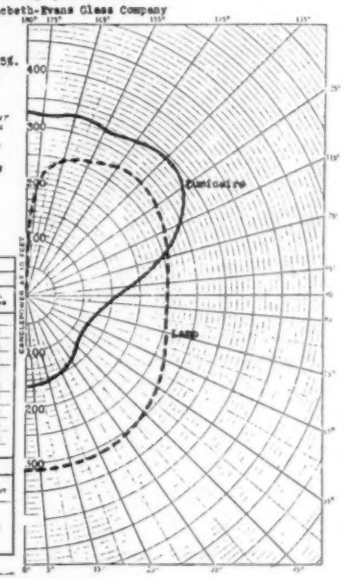
CANDLEPOWER DISTRIBUTION
NO. 3756 GALAX GLOBE

Tested in Compliance with Illuminating Engineering Society Standard Testing Specifications
Rendered to Macbeth-Evans Glass Company

Globes - 80 Submitted; 25 Inspected and Weighed; 6 Tested.
Light output range 76 to 79%. Average 77.5%.
Lamp - 200 Watts; 115 Volts; 3400 Lumens; PS30 Inside Frosted Gas-Filled Bulb; C-9 Filament; Medium Base; General Service.
Surface covering globe opening, reflection factor 0.40.



White Diffusing Glass
Weight of test sample - 63.5 oz.



LUMINAIRE DISTRIBUTION DATA
MEAN VERTICAL

MID-ZONE ANGLES	CANDLEPOWER AT 10 FEET	ZONAL LUMENS	MID-ZONE ANGLES	CANDLEPOWER AT 10 FEET	ZONAL LUMENS
180° UP	327		90° HOR.	156	
175°	322	31	85°	144	157
165°	330	93	75°	124	133
155°	323	150	65°	118	117
145°	333	210	55°	118	106
135°	348	268	45°	134	98
125°	332	297	35°	139	87
115°	295	293	25°	150	70
105°	245	262	15°	156	45
95°	182	202	5°	161	15
			0° HOR.	162	

LIGHT FLUX VALUES

ZONE	LUMENS LAMP	LUMENS LUMINAIRE	PER CENT TOTAL LUMENS EACH LAMP	PER CENT LIGHT OUTPUT
0°-60°	934	421	12.5	77.5
0°-90°	1742	828	24.5	
90°-180°	1656	1806	53	
0°-180°	3398	2634	77.5	

LUMINAIRE BRIGHTNESS

CANDLEPOWER PER SQUARE INCH
THE ARROWS INDICATE THE LOCATION AND ANGLE OF VIEW

LOCATIONS	A	B	C	D	E	F	G	H	I	J	K	L	M
CP PER SQ. IN.	1.0	1.2	1.0	6.2	2.6	1.0	1.5	1.2	2.2	2.0	0.9	1.6	3.6

TESTED BY [illegible] PLOTTED BY [illegible] COMPUTED BY [illegible] CHECKED BY [illegible] ISSUED February 28th, 1935

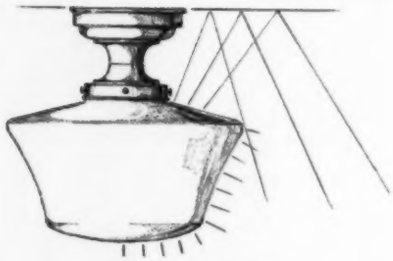
*E.T.L. Identification No. 5294

APPROVED BY
William F. Kiesel
ENGINEER IN CHARGE OF PHOTOMETRY

C. E. Howe
IN CHARGE OF TEST

"ROMANESQUE"

(Semi-Indirect)



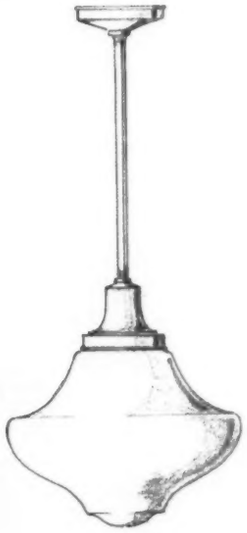
Close-up for Low Ceilings

Galax Brand Glass

Mould Number	Description	Diam., Inches	Depth, Inches	Fitter Diam., Inches
12009	Galax	10	7 7/16	4
12010	Galax	12	8 3/4	6
12011	Galax (Brand)	14	10	6
12012	Galax (Brand)	16	11 3/8	6
12014	Galax (Brand)	18	12 1/2	6

"THE HALLSTADT"

(Semi-Indirect)

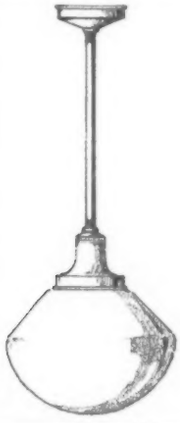


Galax Brand Glass

Mould Number	Description	Diam., Inches	Depth, Inches	Fitter Diam., Inches
4385	Galax	10	7 5/8	4
4309	Galax	12	9 1/2	6
4309A	Galax	12	9 1/2	4
3756	Galax (Brand)	14	10	6
4386	Galax (Brand)	16	12	6
5667	Galax (Brand)	18	13 1/8	8
12007	Galax (Brand)	20	14 1/2	8

"THE SEVILLE"
Monax Glass

Mould No.	Description	Diam., Inches	Depth, Inches	Fitter Diam., Inches
5294-A	Monax	8 ½	5 9/16	4
5340	Monax	9	6 ½	4
5295	Monax	10	6 ½	4
5296	Monax	12	7 ¾	6
5296-A	Monax	12	7 ¾	4
5297	Monax	14	9	6
5298	Monax	16	10 ¼	6
5645-A	Monax	18	11 ⅜	6
5666	Monax	20	12 ¾	8



"THE PILGRIM"
Monax Glass

Mould No.	Description	Diam., Inches	Depth, Inches	Fitter Diam., Inches
12300	Monax	8 7/16	7	4
12301	Monax	9 7/16	7 ½	4
12302	Monax	10 7/16	8 5/16	4
12304	Monax	12	9 3/16	6
12305	Monax	14	10 ½	6
12306	Monax	16	11 ¾	6
12307	Monax	18	13 3/16	6

VESTIBULES, LOBBIES, ETC.

MONAX EXIT CUBE

Number	Dimensions
2347 Des. 44 Monax	6" Cube 3¼" Fitter

The lettering appears upon three sides of the cube.
The bottom is white diffusing glass permitting light to be directed on the floor of the exit.
Can be furnished upright with lettering reversed if specified.

MONAX CUBES

Mould No.	Description	Diam., Inches	Depth, Inches	Fitter Diam., Inches
12087	Monax	4⅜	4⅜	3¼
2347	Monax	6	6	3¼
12089	Monax	7	7	4
12088	Monax	8	8	4

A Close-up
Cylinder Lantern for Low Ceilings

MONAX CYLINDERS

Diam.	Max. Length
2"	21"
2⅛"	14"
3"	18"
3½"	14"
4"	19"
4½"	32"
5"	16"
6"	21"
7"	16"
8"	26"
10"	18"
12"	36"
13⅝"	28"

Lanterns of All Sizes and Styles Can Be Made with Glass Cylinders

CORRIDORS — WASHROOMS — CLOAKROOMS
MONAX GLASS

ROUND BALL GLOBES

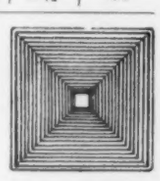
Mould No.	Description	Diam., Inches	Depth, Inches	Fitter Diam., Inches
828	Monax	6	6	3¼
830	Monax	7	7	3¼
832	Monax	8	8	4
850	Monax	10	10	4
848	Monax	10	10	5
849	Monax	10	10	6
838	Monax	12	12	6
1527	Monax	12	12	8

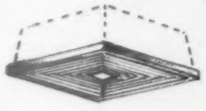
BOWL TYPE SHADE

Mould No.	Description	Diam., Ins.	Dpth., Ins.	Fitter Diam., Ins.	Recommended Wattage
12336	Monax	6¼	4¾	2¼	40
1623-A	Monax	7	5	2¼	50
12314	Monax	8	5 11/16	2¼	60

ALVAX

Mould Number	Side Dimension	Thickness
12109	6½"	¼"
12117	8"	¼"
12120	12"	¼"





HALF SHADE

Mould No.	Description	Lgth., Ins.	Hght., Ins.	Fitter Diam., Ins.	Recommended Wattage
4221	Monax	6	3 7/32	2¼	40

THE F. W. WAKEFIELD BRASS COMPANY

1938 Yearwood Park, Vermilion, Ohio

Over 30 Years in the Manufacture of Lighting Equipment

DISTRIBUTORS IN 75 CITIES

FOR BETTER SEEING
in new schools
and old schools

The COMMODORE

New lighting unit of Plaskon provides ample, glareless light . . . cuts maintenance cost

THE COMMODORE is scientifically designed to provide the right kind of light to protect and help the eyes of both pupils and teachers. And its precision-molded shade of Plaskon, weighing OUNCES instead of pounds, brings to users of this new indirect lighting unit these advantages: 1. less breakage; 2. increased safety; 3. easy cleaning; 4. low maintenance costs.

SEE WHAT A DIFFERENCE THE COMMODORE MAKES!

Here is a "before and after" story in one picture

This unretouched night photograph taken outdoors to show indoor lighting tells very dramatically how the Commodore improves seeing conditions in schoolrooms. The upper room was lighted with the former units; the lower, with Commodores.

GIVES MORE LIGHT . . . AND BETTER LIGHT

The Commodore provides 83% of the light from the bare bulb, according to Electrical Testing Laboratories, famous New York research and testing organization . . . more light than most indirect fixtures. And this light is more restful to eyesight because it is diffused and the shade is low in brightness. For best results, light ceilings are necessary.

MODERNIZES SCHOOLROOMS OVER NIGHT

Relighted with the Commodore, this room below became a new and more satisfactory place in which to work. Thanks to modern seeing conditions, as well as to the Commodore's smart modern design, attractive white Plaskon shade and brushed aluminum shaft, this old lecture room seemed more up-to-date . . . despite a limited budget.

College classroom in Waynesburg, Pa., modernized by Commodores

HELPS BOTH PUPILS AND TEACHERS

The light from this unit helps young eyes and older eyes see better, and helps guard them from eyestrain. One astonished superintendent found teachers coming back to school at night to grade papers, because their light was better. At the same time, the Commodore makes rooms look brighter, cleaner, and more cheerful. Surprising to some, this actually fosters cleanliness, respect for school property and other qualities of better citizenship.

CAFETERIA. Sidney Lanier School, Brunswick, Ga., enjoys glareless, restful, cheery light from Commodores

HALLWAY. Sidney Lanier School, Brunswick, Ga. Better light from Commodores makes accidents less likely, promotes cleanliness

LECTURE ROOM. University of Akron. Engineering Building, Akron, Ohio. Note the smooth, even lighting on seat desks

MANUAL TRAINING ROOM. Lincoln Elementary School, Tonawanda, N. Y. See how easy glareless light makes seeing

HOW PLASKON ADDS EXTRA VALUE

The light reflecting shade or bowl of the Commodore is molded from one of the most modern materials known to science, Plaskon. This magic powder is molded for us by General Electric, under terrific pressure, equal to the weight of 15,000 men, to produce a material that is amazingly tough. It permits very little breakage and will not shatter or splinter when dropped. Obviously, it is safer to handle. And easier, too, since the complete shade weighs only eighteen ounces!

Thanks to Plaskon's high reflecting power and the scientific design to which it is precisely molded, the Commodore is unusually efficient in its light output and gives very even distribution of light. The shade is slightly translucent, which provides an apparent source of light, sufficiently low in brightness to prevent glare. Color is uniform and can be maintained for years if properly used.

WHAT USERS SAY

"I have re-lighted two buildings with Commodores. Will do more as funds permit."

J. E. BOHN, Superintendent of Schools, Ashland, Ohio.

"I have installed the Commodore unit and find that it gives a wonderful light."

THOMAS H. CRAIG, Principal, West Brownsville, Pa.

"We have used your unit and have found it very satisfactory."

JOHN L. CONANT, Murrayville Community High School, Murrayville, Ill.

"The Commodore is by far the best looking fixture I have seen, and I like the durability feature."

WM. D. SMITH, Headmaster, Christchurch School, Christchurch, Va.

ASK FOR YOUR COPY OF THIS HELPFUL BOOKLET

We shall be glad to send you free, an interesting 16-page booklet entitled "Recommendations for Classroom Lighting." Presents many important facts . . . points out the danger of depending too much on window lighting . . . gives case histories on results secured with and without better classroom lighting . . . and makes definite, helpful recommendations for securing it. Or, if you prefer, we can arrange a demonstration of the Commodore in your office. It takes only a jiffy and requires only a floor plug. No obligation.

WESTINGHOUSE ELECTRIC & MFG. CO.

Edgewater Park **LIGHTING DIVISION** Cleveland, Ohio

Complete Interior Lighting Equipment

Magnalux TI Luminaire Silvurn Lunaire

MAGNALUX

The Westinghouse Magnalux luminaire sets a new standard for modern indirect illumination in schools. Magnalux combines glareless efficiency with beauty of design. It provides a soft, luminous radiance that seems to emanate from the ceiling surface . . . restful, harmonious and uniformly distributed. Sight saving classrooms, libraries and study halls are enjoying the many benefits of Magnalux lighting. Westinghouse Magnalux is available in a wide variety of styles and sizes to meet varied lighting requirements and tastes. Write for Magnalux Catalogs 61-250 and F-8407.

TI LUMINAIRE

The new Westinghouse TI luminaire is a totally indirect aluminum lighting unit of modern design, construction and performance. Built for utility, the TI is also smartly styled to harmonize with modern architectural interiors. TI provides efficient, glare-free, well-distributed illumination for many school and university applications. This unit is available in two sizes—for lamps up to 500 watts and lamps up to 1000 watts. For complete details on these TI models, write for Catalogs 61-252 and F-8405.

SILVURN

The Westinghouse Silvurn luminaire provides efficient, economical semi-indirect illumination for school classrooms, study halls and libraries. Styled to fit a variety of modern interiors, Silvurn is notable for its even diffusion of adequate light intensities . . . is a distinct contribution to comfort-seeing. Special design and construction features assure permanence, easy relamping and simplified cleaning. Standard enclosing globe, available in three attractive styles, casts a soft light over the aluminum basin exterior to give the entire luminaire a rich lustre. Write for Silvurn Catalogs 61-250 and F-8406.

LUNAIRE

The Westinghouse Lunaire is a semi-direct enclosing globe type of lighting unit particularly well adapted to the needs of school and university classrooms. With single layer, dual density glass, this unit provides abundant shadowless light for assured eye-conservation of school pupils. A chip-proof, flame-sealed fitter edge is provided on all Westinghouse enclosing globe luminaires, which are available in a wide variety of styles and sizes. Write for enclosing globe Catalog 61-260 and Catalog 61-270.

WESTINGHOUSE ELECTRIC & MFG. CO.

Edgewater Park LIGHTING DIVISION Cleveland, Ohio

Floodlighting and Industrial Lighting

A-16 and A-20
Sturdy, Aluminum Enclosed Units for Building Floodlighting

AV-16 and AV-20
Aluminum, Closed-type Units for Athletic Fields, Drill Fields and General Outdoor Illumination

AFA-16 and AFA-20
Porcelain Enamel, Open - type Units for Football, Baseball and other Athletic Field Illumination

WS-8
Aqualux Underwater Floodlight for Outdoor and Indoor Pools and Fountains

Stack Luminaire for Libraries and Storage Rooms

Typical RLM Industrial Dome Reflector for workshops, Laboratories, Gymnasiums and Locker Rooms

FLOODLIGHTING AND UNDERWATER LIGHTING

Westinghouse floodlights of several types are available to meet the specific requirements of schools and universities. Sturdy construction and the use of aluminum reflectors finished by the Alzak process, insure easy maintenance, high light output and long life. Schools and Universities are installing modern floodlights for athletic fields, swimming pools, tennis courts, campus walks, ornamental lighting, et cetera. For such floodlighting applications, Westinghouse supplies a line of equipment that stands up under severe service conditions and is economical to operate.

ATHLETIC FIELDS

Athletic field illumination with Westinghouse floodlighting equipment is a proved means of increasing attendance at games and extending the normal hours of healthful outdoor recreation. Westinghouse floodlights, types "AV" and "AFA" provide the finest, most efficient floodlighting for football, baseball and softball fields, tennis courts and general school sports-field lighting. Westinghouse floodlighting equipment, properly installed, gives plenty of light for fast play and assured visibility both for players and spectators. Write for the Westinghouse book, "Sports Floodlighting."

SWIMMING POOLS

Westinghouse Aqualux floodlights prolong the use of pools beyond the hours of daylight, insure safety to swimmers and reveal the inviting beauty of water lighted from within. Both for outdoor and indoor use, Westinghouse makes available three types of Aqualux floodlights to meet the requirements of varying pool widths. Complete accessories, including wall receptacles for all units, are also available. Aqualux floodlights for underwater lighting insure a high standard of efficient and trouble-free performance at reasonable installation and operating cost. Write for the Westinghouse Book, "Sports Floodlighting."

SHOPS AND LABORATORIES

The complete Westinghouse line of industrial luminaires offers a wide range of selection for use in wood and metal working shops, laboratories, printing-shops, libraries (Stack Luminaire), gymnasiums, shower and locker rooms (vapor-proof units), university engineering buildings, et cetera. Westinghouse industrial units are available in many types for every specific application. Outstanding features are effective light distribution, low maintenance cost, correct design and high efficiency. See your local Westinghouse Distributor Lighting Specialist or write directly to the Lighting Division for complete details.

GLEASON-TIEBOUT GLASS CO.

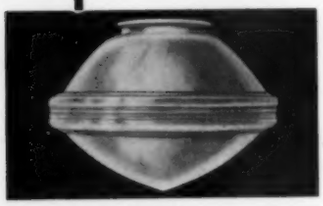
Manufacturers of
Lighting Glassware

CELESTIALITE DIVISION
200 Fifth Ave., N. Y. City

MAIN OFFICE
99 Commercial St., Brooklyn

Here's Why MORE SCHOOLS MODERNIZE *with* CELESTIALITE

Next-to-Daylight Lighting



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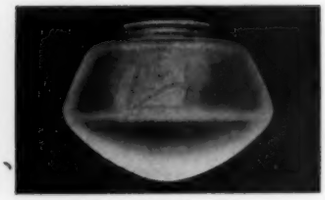

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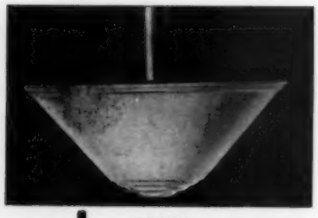

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Hundreds of schools and colleges, hospitals and institutions, are now CELESTIALITED. There can be no better proof of the marked superiority of CELESTIALITE'S lighting glass. Its soft "next-to-daylight" flood of light is easy on the students' eyes, and provides a cheery, wide-awake atmosphere that is an instant endorsement of CELESTIALITE'S high lighting efficiency. Here is but one of numerous laboratory reports substantiating this statement.

LABORATORY REPORT

SUBJECT: Report on CELESTIALITE AND OPAL GLASS (best type of commercial unit glassware).

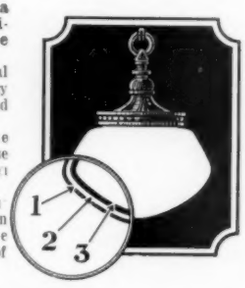
LABORATORY FINDINGS: "The sample of Celestialite Glass sent for test transmitted 82 per cent as much light as the sample of Opal Glass." ● "Equal visibility of the printed page was, however, obtained with only 80 per cent as much light of Celestialite quality as of the quality of the same source (Mazda lamps) transmitted through the Opal Glass." ● "Further, it took only 78-80 per cent as much illumination of Celestialite quality as of the Opal just to discriminate a detail of a given size." ● "It would seem, therefore, that the Celestialite glass gives an illumination which is superior to the Opal from the standpoints of visual acuity, visibility, eye comfort, and diffusion of light."

Signed: The Research Laboratory of Physiological Optics—Baltimore, Md.

The Principle of CELESTIALITE

Celestialite is a scientific combination of three layers of glass:

1. A layer of crystal clear transparency for body and strength
2. A layer of white glass, to diffuse the rays and soften the light
3. A layer of blue glass — to whiten and improve the quality of the light



A Few Leading Schools and Colleges with Celestialite Installations

Amherst	Wellesley	Virginia
Wesleyan	Hunter	University of Texas
Columbia	Wells College	City of Boston
Princeton	Holy Cross	City of Rochester
Bryn Mawr	Cornell	City of New York
	Pennsylvania	

●

Modernize with CELESTIALITE

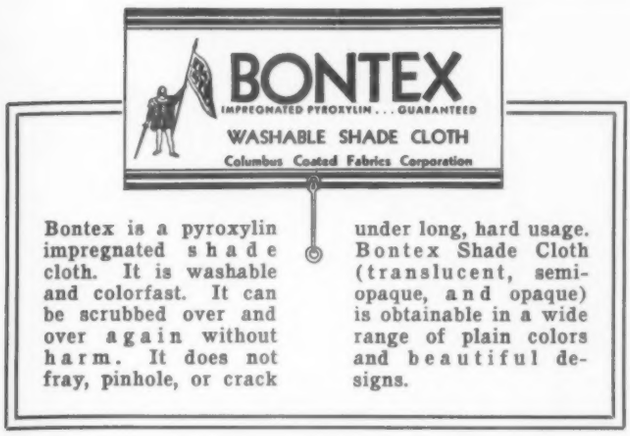
Next-to-Daylight Lighting

Celestialite Division
200 Fifth Ave., N. Y. City

Main Office
99 Commercial St., Brooklyn

COLUMBUS COATED FABRICS CORPORATION

Columbus, Ohio


BONTEX
IMPREGNATED PYROXYLIN . . . GUARANTEED
WASHABLE SHADE CLOTH
Columbus Coated Fabrics Corporation
Bontex is a pyroxylin impregnated shade cloth. It is washable and colorfast. It can be scrubbed over and over again without harm. It does not fray, pinhole, or crack under long, hard usage. Bontex Shade Cloth (translucent, semi-opaque, and opaque) is obtainable in a wide range of plain colors and beautiful designs.

BONTEX stands high in favor in the schools of America. Years ago its makers, the world's largest manufacturers of coated fabrics, determined to build superior shade cloth which would meet the special requirements of schoolroom use. Every known scientific test was applied to it. Impartial authorities gave it their highest endorsement. It was placed in schools and watched carefully. Thru the years, Bontex has built a reputation which has led to its unqualified acceptance by the nation's finest schools everywhere.

Soft, Non-glaring Light—Today, better light for the protection of children's eyes is one of the first considerations of the modern school. Soft, diffused, non-glaring light enters the room thru Bontex Translucent and Semi-Opaque Shade Cloth. With Bontex there is less eye strain. Children have fewer headaches, do their work better and teachers get less blame. Bontex conforms to rules suggested by the Eyesight Conservation Council for equipping windows with proper shades.

Quality for Long Service—Pyroxylin-impregnated Bontex has never been known to pinhole, fray, crack, or fade no matter how much it has been scorched by hot sun, lashed by wind, soaked by rain, or carelessly handled by youngsters in the schoolroom. It's closely woven. It has unusual tensile strength. It's made to stand repeated scrubbings. It outwears ordinary shade cloth several times—and looks more attractive from the first day to the last.

Quality Plus Economy—Why pay nearly as much for shade cloth that lasts only a fraction as long as Bontex? Decide on Bontex and get the real economy of lower-per-year cost. Bontex Shade Cloth conforms to government specifications CCC-C-521 and DDD-S-251 and its quality is guaranteed by the government label.

For All School Purposes—Bontex Shade Cloth—translucent, semi-opaque and opaque—is available in 12 plain colors, 5 beautiful corded designs, 5 duplex colors and 5 modern printed patterns. Also made in black—absolutely opaque—for rooms where complete darkness is required.

FREE SAMPLE BOOK

Shows the full range of 28 Bontex patterns. Write to Columbus for this Sample Book and full information.

Bontex Shades in a Classroom of the Bexley High School, One of Ohio's Finest. Bontex Window Shades Are Installed Thruout 2862

ATHEY COMPANY

6034 West Sixty-Fifth St.

Chicago, Illinois

PERENNIAL WINDOW SHADES
CLOTH-LINED METAL WEATHERSTRIPS
ATHEY SEALTITE CAULKING COMPOUNDS

Athey Products

ATHEY DISAPPEARING SKYLIGHT SHADE
ATHEY VENETIAN BLINDS

Information and prices gladly given on request

ATHEY PERENNIAL WINDOW SHADES

Athey Perennial Window Shades are ideal for use in school and college buildings of all kinds, for, being translucent, the shades with the sun on them throw a soft light over the room, giving sunlight without glare, and conserving the eyesight of the pupils.

Being instantly adjustable to cover any part of the window necessary, they permit the windows being opened at both top and bottom, insuring better room ventilation, and, operating on bronze guide wires, flapping of shades when window is open is eliminated.

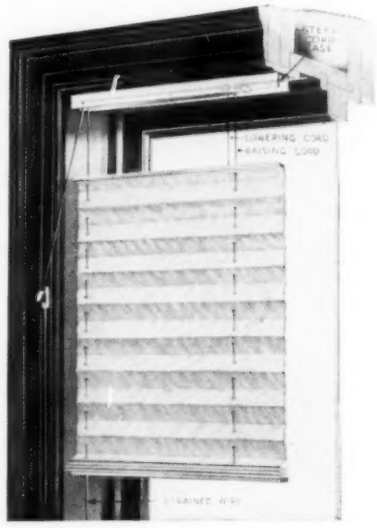
Made of the strongest and most durable material ever used for shades, they last longer than other shades, so on a cost per year basis are the most economical shade obtainable.

They are exceptionally attractive with their cockle finish and pleats, coming in a choice of several colors, and in widths up to seventeen feet.

The black opaque shades are useful for darkening assembly rooms and classrooms for motion picture projection.

Schools, colleges and auditoriums find Athey Shades ideal for skylights, too — the translucent shades for protecting against glare and heat, and the black shades for darkening rooms for motion pictures.

School Lunchroom Equipped With Athey Shades

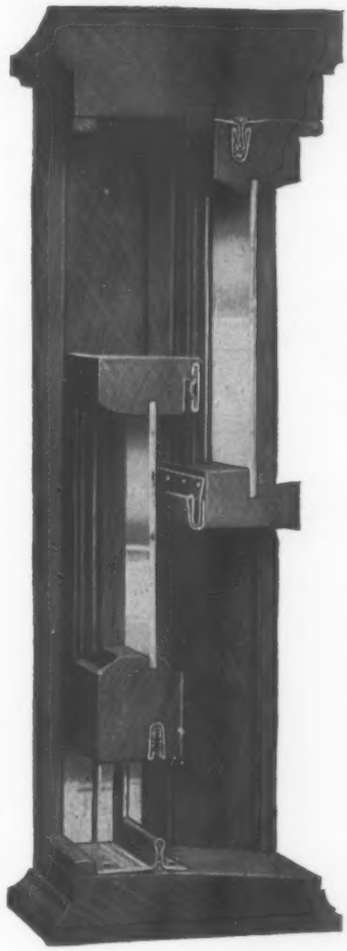


Write for catalog.

A Few of the Hundreds of Prominent Schools and Colleges Using Athey Shades:

Woodrow Wilson High School	Los Angeles, Calif.
St. Francis Academy	Joliet, Ill.
Saginaw High School	Saginaw, Mich.
State Normal College	Cortland, N. Y.
Junior Senior High School	Rye, N. Y.
Adelphi College	Garden City, L. I., N. Y.
The Choate School	Wallingford, Conn.
Wm. Penn Charter School	Philadelphia, Pa.
Henry Schaf School	Parma, Ohio
Solomon Juneau School	Milwaukee, Wisc.
Bisbee Public School	Bisbee, Ariz.
University of S. C.	Columbia, S. C.
Arlington School	Spokane, Wash.
University of Hawaii	Honolulu, T. H.
National College of Education	Evanston, Ill.
Nazareth Academy	Kalamazoo, Mich.
Junior High School	Ann Arbor, Mich.
Colt Memorial High School	Bristol, R. I.
Junior-Senior High School	Louisville, Ky.
Steuben High School	Milwaukee, Wisc.
University of Detroit	Detroit, Mich.
Toledo University	Toledo, Ohio
University of Nevada	Reno, Nev.

ATHEY WEATHERSTRIP



ATHEY Cloth Lined Metal Weatherstrip, the only weatherstrip using the cloth to metal feature, has been on the market for over 28 years. It has been installed on many of the best and largest buildings in the United States and Canada for owners and architects who desire the best, even though the initial cost is higher than for ordinary weatherstrip. Of our early installations we can point to St. Anthony's Hospital of St. Louis and the Blackstone Hotel of Chicago, who are still obtaining the maximum in efficiency after twenty-seven years of service, making the yearly cost low in comparison with cheap, ordinary weatherstrip.

Unlike the ordinary channel used in many two-piece strip installations, the Athey channel is double the ordinary width and lined with a cloth material manufactured especially for this purpose, which not only prevents all air leakage but is a dust-proofing and soundproofing as well. Rail members are also backed with felt, which prevents leakage at the jamb, a common weakness in ordinary weatherstrip installations due to infrequent nailing of the rail member. All cloth and felt used is chemically treated, guarding against rot and deterioration, so this part of the weatherstrip, as well as the metal, is guaranteed for the life of the building. The best grade of sheet zinc is used on all strip.

No drafts, rattling of sash when Athey strip is used, and the cost of your installation will be repaid in coal savings in from two to three years. Athey Weatherstrip is installed by authorized representatives with trained workmen. Write us for catalog and name of nearest dealer.

A few of the many Schools and Colleges using Athey Weatherstrip:

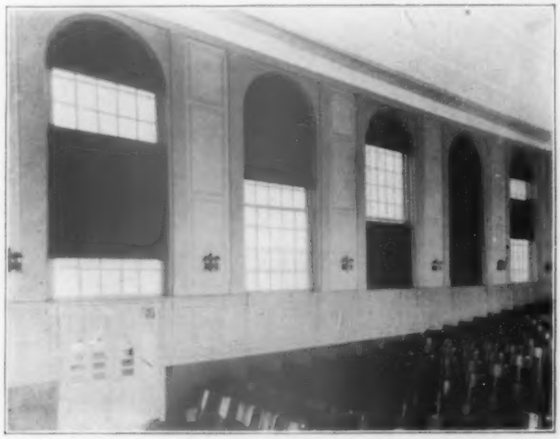
Streator High School, Streator, Ill.
Western Reserve Academy, Hudson, Ohio
Purdue University, Lafayette, Ind.
Cattaraugus School, Cattaraugus, N. Y.
Johns Hopkins University, Baltimore, Md.
Wesleyan University, Middleton, Conn.
Woodlawn High School, Birmingham, Ala.
Lincoln School, Great Falls, Mont.
Sandia School, Albuquerque, N. M.

SEALTITE CAULKING

Knife or gun grade. Permanently elastic, impervious to heat or cold, adheres to wood, stone or metal, stainless. Standard colors white and gray, special colors to order. Approved by U. S. Bureau of Standards for government use.

Write for catalog

National Kindergarten, Evanston, Ill.



Black Shades in Use in Lexington High School, Lexington, Mass.

JAS. H. MATTHEWS & CO.

3741 Forbes Street, Pittsburgh, Pa.

BRANCHES

Philadelphia, Pa., 401 N. Broad Street
Detroit, Mich., 6476 Moran Street
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Chicago, Ill., 3729 Belmont Avenue

SCHOOL MEMORIALS SYMBOLIZE NOBLE IDEALS

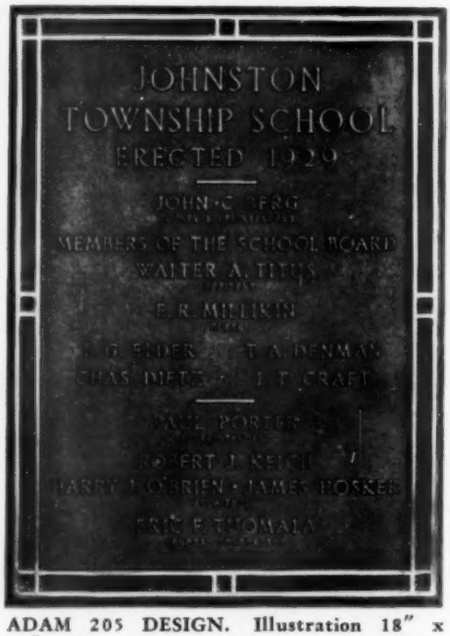
BRONZE or ALUMINUM

MEMORIALS of Bronze or Aluminum, most beautiful and permanent of metals, have memorialized outstanding lives and events of many schools and universities.

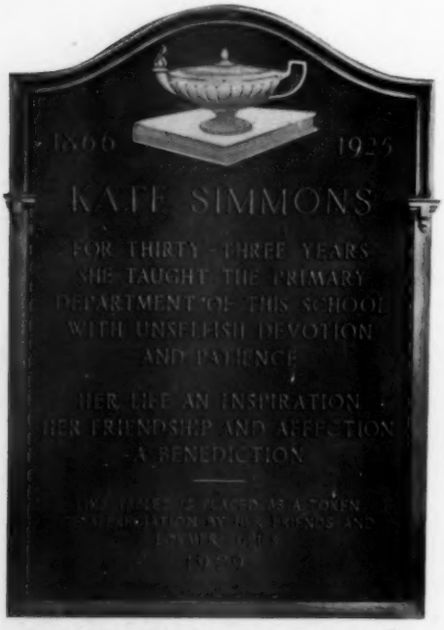
In one school, a founder or benefactor has been memorialized . . . in another, the memorial to a college president inspires the daily lives of students. Here, an Honor Roll memorializes the names of presidents . . . instructors or students, . . . there, trophies of honor were presented for development in research, scholarship or athletic ability.

Whatever the memorial, made by Matthews it will be most appropriate and of the finest craftsmanship. Master patterns make it inexpensive, or we will work from a design created by you. Tell us the approximate size and wording and we will promptly send literature, sketches, and prices.

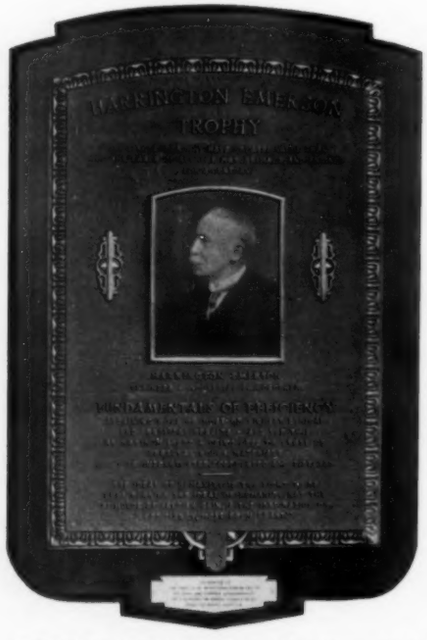
STANDARD or CREATED DESIGNS



ADAM 205 DESIGN. Illustration 18″ x 24″. Other standard patterns available 18″ x 12″, 26″ x 14″, 30″ x 20″ and 36″ x 30″



SIMMONS DESIGN. Size shown 28″ x 40″. Specially modeled design made any size to meet requirements



EMERSON DESIGN. Beautiful "Intaglio" etching on gold or bronze. Plaque 16″ x 25″. Wood mount 20″ x 30″

GENERAL BRONZE CORPORATION

34-19 Tenth Street Long Island City, N. Y.

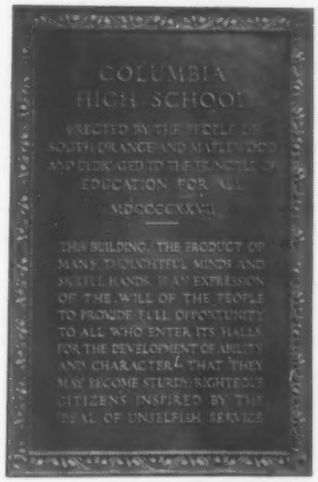
Architectural Metal Work · Windows · Revolving Doors · Tablets

PERMATITE WINDOWS
FOR SCHOOLS AND UNIVERSITY BUILDINGS
In Bronze or Aluminum

FOR Schools and University Buildings PERMATITE Bronze or Aluminum Windows are especially appropriate.

PERMATITE Windows—Double Hung or Casement—provide maximum visibility, increasing the area admitting light and sunshine.

These windows are weathertight—due to in-built patented metal weatherstripping. No drafts, rain or dust can enter—ideal for temperature control, with fuel savings.



A typical General Bronze Tablet

PERMATITE windows are sturdy and quiet in operation. No noise to distract the student. Easy to operate—free from warping or sticking. Maintenance cost is negligible, for no painting is necessary. They cannot rust.

The high quality of workmanship, materials and design makes PERMATITE windows suitable for all types of School buildings.

Cost is appreciably less than formerly for windows of lower efficiency and no higher quality.

One type of Permatite Double Hung Window

All types of architectural and ornamental metal in bronze, aluminum, monel, nickel silver. A partial list of General Bronze products for school and university buildings includes:

Balustrades	Gates	Railings
Doors	Grilles	Signs
Elevator Doors	Lamp Standards	Spandrels
Entrances	Marquises	Tablets

A fully illustrated catalog gives complete details and specifications

One type of Permatite Casement Window

Bronze Balcony Rail — Federal Reserve Building, Washington, D. C. Paul Philippe Cret, Architect

LEVERING BROTHERS, INC.

Established 1899

General Offices: 200 Key Highway, Baltimore, Md.

FOUNDRIES: Hanover, Pa.; York, Pa.

Bronze and Aluminum Tablets, Honor Rolls, Name Plates, Bas Relief, Plaques, Scrolls, Cast Letters

PRODUCTS

Machine Castings:—

Gray Iron
Semi-Steel
Steel
Malleable Iron
Brass
Bronze
Aluminum
Nickel-Alloy

BRONZE

The Eternal Metal

A Bronze Tablet lasts forever and actually improves with age, becoming more and more beautiful as time goes on.

Bronze work by Levering Brothers, Inc., from the simplest to the most intricate piece, is of unsurpassed beauty of design and craftsmanship. Prices are as low as possible consistent with high-grade workmanship and materials.

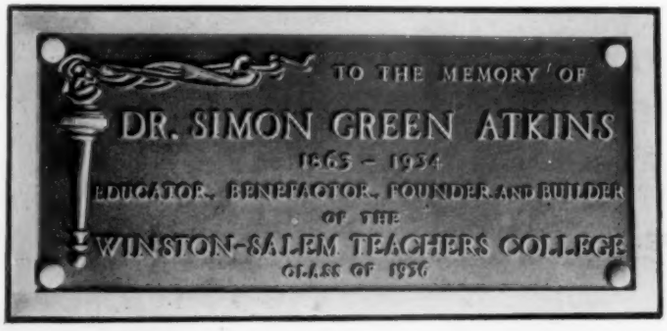
18" x 24" School Tablet

All our bronze work is made in strict conformance with U. S. Bureau of Standard specifications for statuary bronze.

ALUMINUM

Another Beautiful and Lasting Material for School Memorials and Tablets

Although Aluminum Castings have not long been in use in the design and composition of memorials, tablets and wall plaques, both the beauty and the long life of Aluminum make it a perfect metal for the purpose—and no more expensive than bronze, when you consider its lighter weight.



EXPERIENCE

Levering Brothers' long experience — thirty-eight years of skillful, high-grade accomplishment in the design and manufacture of all types of castings—is your assurance of satisfaction with any Levering Brothers' product.

ALBERT CABELL RITCHIE
MARYLAND'S DISTINGUISHED SON
BORN AUGUST 29, 1876—DIED FEBRUARY 24, 1936
GOVERNOR 1920 TO 1935—HE WROTE INTO MARYLAND
HISTORY AN IMPRESSIVE CHAPTER AS LASTING AS
THIS BRONZE TRIBUTE FROM HIS FELLOW-MEMBERS
OF THE ADVERTISING CLUB OF BALTIMORE

Above—
11" x 26" Tablet

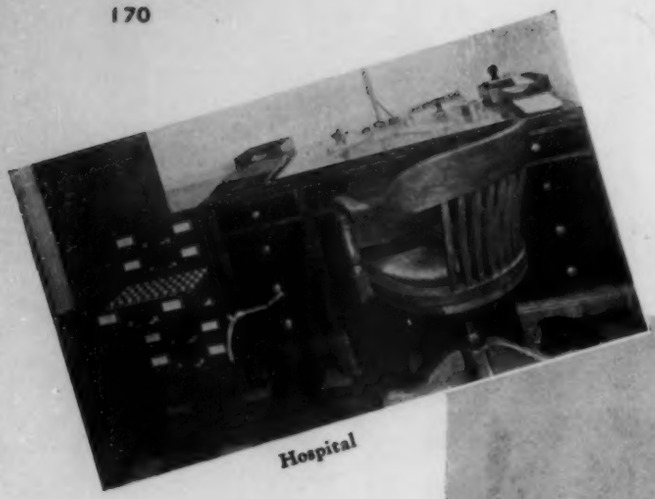
At left—
14" x 20" Memorial Tablet

At right—
18" x 24" School Tablet

Your inquiries are solicited.

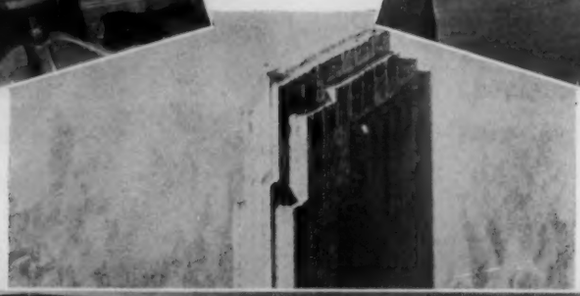
VISIBLE KEY CONTROL SYSTEM

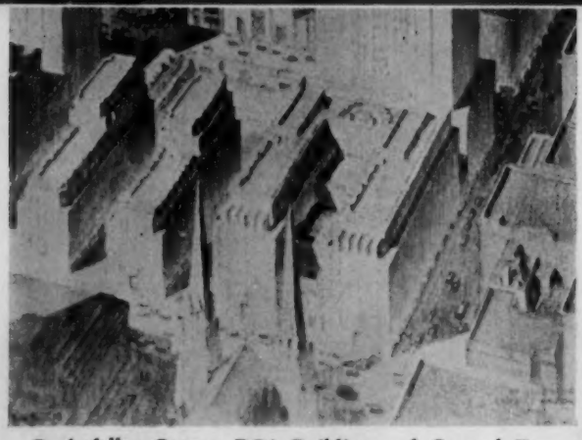
PRODUCT
OF
P. O. MOORE, INC.
NEW YORK



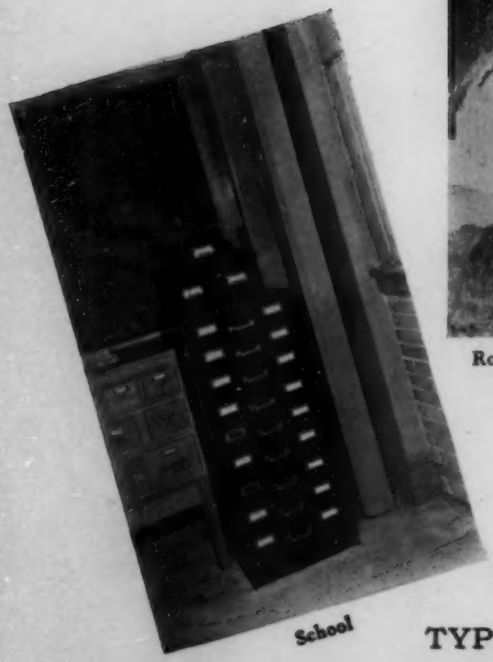
Hospital

Apartment House

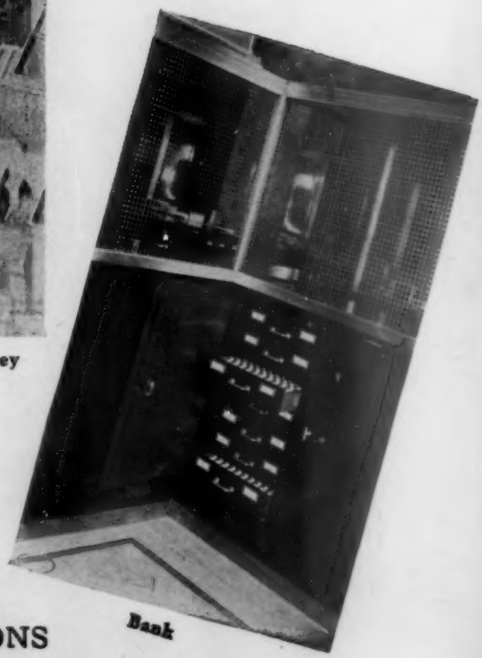




Rockefeller Center, RCA Building and Central Key Control Installation



School



Bank

TYPICAL TELKEE INSTALLATIONS

TELKEE
TRADE MARK

KEY CONTROL

Many millions of dollars are spent annually for locks and keys to furnish privacy or to secure valuables against prying eyes and thieving hands.

When population was scattered, buildings small and management more personal, the control of keys offered no problem. A "key rack" furnished by the local carpenter with cup hooks and with paper identification tags for keys solved most requirements.

With the advent of the "skyscraper," the hospital for hundreds of patients, the school for thousands of pupils, large businesses with tens of thousands of employees, the problem of maintaining locks and handling and controlling keys became a major problem **if the original value and purpose of the locks were to be preserved.** It is nothing extraordinary today to have accumulations of thousands, tens of thousands, of locks in one institution with two to five times that number of keys. With the complexity of modern society even a modest family with house, garage, automobile, cabinets, trunks, bags, etc., frequently has an accumulation of fifty to a hundred locks with their attendant keys.

The mere housing alone of these accumulations of keys became a confused and confusing problem. Demands were made for a better, a more comprehensive and systematized method of housing and controlling; for a simple, easily operated system that would eliminate the confusion and lack of control of the older methods and reduce the rising costs of lock maintenance, variously estimated at from 50¢ to $1.50 per lock per year during the life of a building.

TelKee is offered in response to this demand and as a solution of these problems. We thank the Architects, Building Hardware Manufacturers, many Building Superintendents and Business Managers who have assisted us with their experience and counsel.

P. O. MOORE, INC.

300 Fourth Avenue **New York**

DISTRIBUTORS IN ALL PRINCIPAL CITIES

Exposition of the TELKEE VISIBLE KEY CONTROL *System*

CENTRAL KEY CONTROL

To obtain continuity of control and the best results from any systematic method of handling keys, all authorities are unanimous that key maintenance should be placed in General Executive Offices.

Here in cabinets should be a Reserve-Pattern or Record key to every lock in the building or buildings, all Duplicate keys not issued to departments, employees or tenants, and signature receipts for all keys issued. Here should be the supervision, the issuance of keys to, and their recovery from departments and individuals and the ordering of necessary additional duplicates. This control should include not only the room and entrance keys but also keys to all lockers, files, desks, cabinets, etc.

In the larger Institutions and Corporations having many buildings and departments, additional smaller capacity cabinets are necessary in building maintenance departments, also frequently in laboratories, shops, etc., but they should contain only keys in active daily use in the departments and be entirely supplemental to the Master File in the executive office.

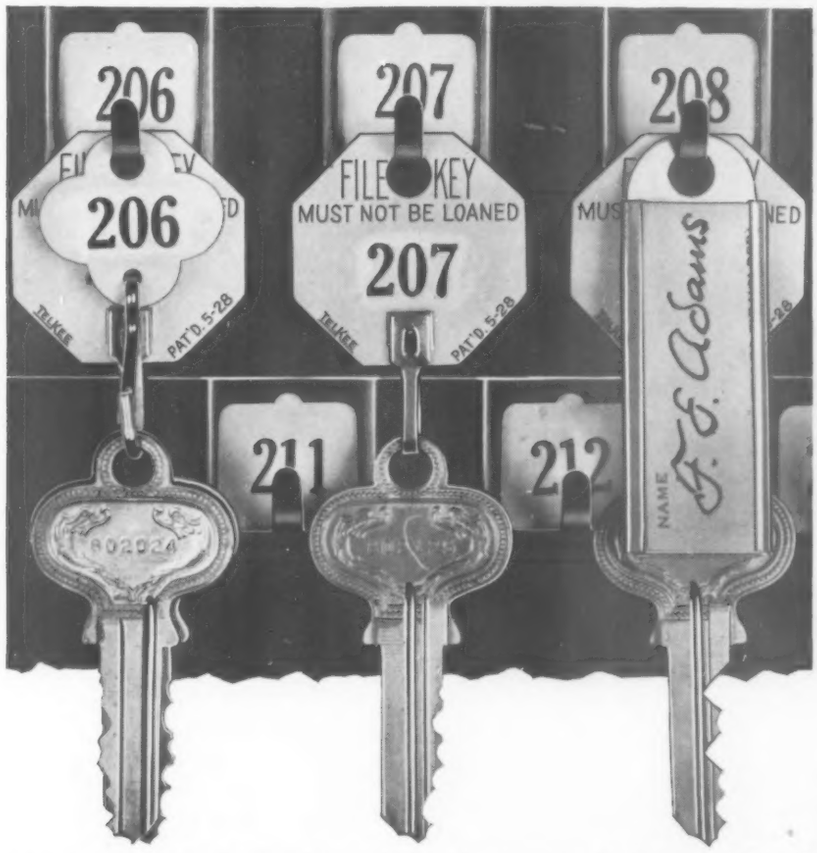
On account of the unsightly appearance and space wasting properties of the wall hanging type of key cabinet, maintenance and control of keys has usually been allocated to the engineer's quarters, or piecemeal to the various departments, with the result that no greater measure of control was exercised than dictated by the personal thought of the individual department head.

TelKee, to meet this objection to an executive key control, offers a variety of different types of stock cabinets manufactured on the lines of modern office equipment and in individual capacities from 50 to 1400 sets of keys. Fabricated in high grade furniture steel with baked on enamel finish, they harmonize with present day office files and cabinets and as many as 1000 sets of keys can be maintained in a space 18″ wide by 30″ high by 12″ deep. Except in the smaller capacities, these cabinets are made to stand on the floor in line with other files, or on stands, on tables, or on top of other files.

TelKee cabinets are a desirable but not an essential part of the TelKee System of Key Control. They are only a means to an end. Where satisfactory key cabinets are already in use in older buildings, they can frequently be serviced with TelKee accessories to furnish TelKee results, and always are available as supplemental cabinets in departments.

TELKEE IN OPERATION

FULL SIZE SECTION OF KEYBOARD,
SHOWING TYPICAL TELKEE SYSTEM ARRANGEMENT



HOOK 206—showing Reserve Pattern Key with permanent Marker attached, and two unissued duplicate keys with temporary Marker attached.

HOOK 207—showing Reserve Pattern Key. Duplicate keys have been issued with no receipt taken.

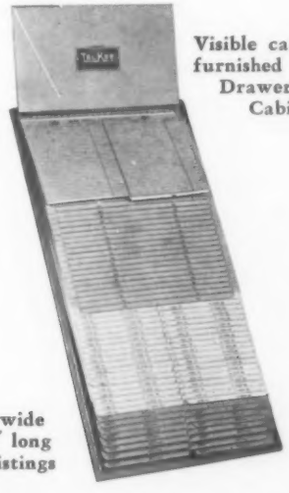
HOOK 208—showing Reserve Pattern Key, together with Receipt Holder carrying folded Receipt Record for the Duplicate Keys issued.

The Hook is of sufficient depth to accommodate, in addition to the "Reserve Pattern Key" as many as four duplicate keys.

CROSS INDEXES

Tumble Card

8½" wide by 6". Furnished in Units W.C. 150-250
320 listings



Visible card furnished with Drawer File Cabinet

8½" wide by 25" long
3040 listings

Book
Loose Leaf Ring

5" wide by 9" long. Furnished with Units P.S., H.T. and L.T.
2400 listings

Capacities Given Are Maximum Number Single Space Typewritten Listings Each for Alphabetical, Numerical and Lock Serial Indexing

TELKEE SYSTEM

Visibility

Since time immemorial, keys have been hung on hooks and modern methods have found no better way of handling them. This follows the modern business trend of maintaining visibly all business records that permit of it.

In order to save space, efforts have been made to file keys in envelopes or on cards in Card Drawer Cabinets. But experience has proven that keys cannot successfully be controlled in blind files. A key once misfiled in an envelope is lost for all practical purposes.

TelKee, to enhance visibility, increase efficiency and assist control, makes use of a small label pocket built in combination with, and behind and above the hook.

Into this is inserted a heavy paper printed label to identify that hook numerically with a room or locker number or a numerical cross index. It promotes easy filing—easy finding. To save space these combination hook-and-label pockets are spot welded to the TelKee panels in staggered rows so that keys hanging from one hook do not destroy the visibility of the labels and keys in the row below.

"Reserve-Pattern" Key Markers

The one greatest item in the expense of maintaining locks in accumulations great or small is caused by the loss, or unavailability, of all keys to a lock, or the possession of only badly fitted duplicates. This lack of keys with which to operate locks, in large installations, is the cause of the employment, on part or full time, of an expert or semi-expert locksmith to change or repair locks and fit and refit keys. In smaller installations it is the cause of endless confusion, annoyance, delay and the expense of new locks. This can be practically eliminated by making provision to always retain one original manufacturer's key to each lock; this key to be preserved as a "Reserve-Pattern" or Record key in the Master File. It should only be available as a "Reserve" key in case of an emergency and to be returned to the Master File immediately after use, or as a "Pattern" key from which all additional desired extra keys should be cut. Keys made from extra keys are a great source of trouble and expense as generally a key cut from an extra that in turn has been made from an extra will jam the lock. All extra keys should be either purchased direct from the Manufacturer or cut from an original key.

TelKee provides, to distinguish such keys, an octagonal heavy red fiber key marker **with a special brass clasp** which, once locked on a key, cannot be removed except by intentional destruction. It is octagonal in

shape and red in color to distinguish it from other markers and is die-stamped "File Key—Must Not Be Loaned." It should also be die-stamped and enameled with a numerical number to correspond with the number in the label pocket behind the hook. If it is missing or misfiled it is noticeable at once. **This key should be preserved throughout the life of the building and the lock.**

Duplicate Key Markers

Lock Manufacturers usually furnish 3 keys for each building door lock and 2 keys with lockers, desks, files, etc. Frequently owners have a need for more keys and have extra ones made. As we have seen, one of these originals is identified as a "Reserve-Pattern." The other keys, duplicate or extras, should be identified while in the cabinet to prevent misfiling.

TelKee furnishes for this purpose a Duplicate Key Marker. It has a type of clasp which permits the putting on or taking off of as many as three keys. It is

clover leaf in shape and made of white fiber to distinguish it from the Reserve-Pattern marker. It should be die-stamped and enameled with a numerical number to correspond with the number on the Reserve-Pattern key marker for that lock.

DRAWER FILE CABINET

A specially built Filing Cabinet in counter height to stand in line with standard office files or to be incorporated in counter equipment. If desired, a sanitary base brings it up to four drawer letter file height.

Manufactured in high grade furniture steel to conform with standard office equipment. Panel drawers operate on roller bearing progressive slide suspensions. Unit paracentric pilaster lock controls all drawers.

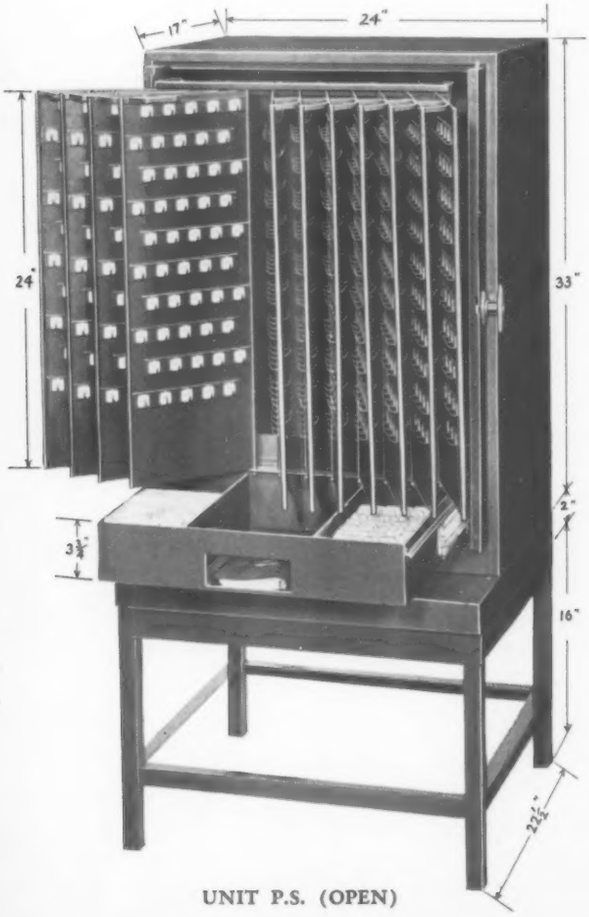
Panel drawers are equipped on the sides with a special device to hold panels firmly in a forty-five degree angle position to enhance visibility but permit them to be rocked forward on the bottom edges to a vertical position for convenient handling of keys. Device allows a flexible build up capacity from a minimum of 5 panels per drawer to a maximum of 12. Each panel (15¾" w. x 6¼" h.) is equipped with 2 staggered rows of 10 each combination hook-and-label pockets.

Index drawer has a visible card index panel with a maximum capacity of 96 5 x 8 tumble head cards furnishing 3040 single space typewritten listings each for alphabetical, numerical and lock serial indexing.

Standard finish baked on enamel Olive Green. Walnut or Mahogany, or finish to match sample submitted, furnished to order.

Capacity Sets of Keys	No. of Panels	Total Hooks	Outside Dimensions
600	30	600	18⅞ x 41 x 25¾
800	40	800	do
1000	50	1000	do
1200	60	1200	do
1440	72	1440	do

RECEDING DOOR CABINET
UNIT P.S.



UNIT P.S. (OPEN)

Designed for very active use where extreme visibility and accessibility is desired. Doors recede within the sides of the cabinet. With the opening of the doors the key panel carriage draws forward on progressive roller slide suspension to working position. Key panels swing in pin and socket bearings top and bottom. Spread of panels in full open position is 35 inches.

Each panel is equipped with 100 combination hook and label pockets (50 each side) except the end ones which are blank on the outside. Flexible build up capacity by panels from a minimum of six panels (500 capacity) to a maximum of nine 100 hook and two 50 hook panels (1000 capacity). In the panel carriage and below the panels are compartments for 3 x 5 cards, extra markers and the cross index book.

Regularly equipped with paracentric key in handle lock, blank or serially numbered hook labels and Cross Index Book.

Designed for use on counter or table. Cannot be fastened to wall. Special stands as shown in illustration can be furnished.

Standard Olive Green finish.

Walnut or Mahogany can be furnished to order.

Cat. No.	No. of Panels 100 Hks.	50 Hks.	Total Hooks	Outside Dimensions
PS422	4	2	500	24 x 33 x 17¼
PS522	5	2	600	do
PS622	6	2	700	do
PS722	7	2	800	do
PS822	8	2	900	do
PS922	9	2	1000	do
PS Stands for use with above cabinets.				24 1/16 x 15⅞ x 22 1/16

Receipts

When keys are issued to employees with no record kept of such issuance, no adequate control can be maintained and no responsibility placed for misuse. To guard the privacy and security afforded by locks it is necessary that the Management be able to ascertain positively at any time how many keys have been issued for any lock—to whom and when.

Many Institutions surround the issuance of keys with considerable formality and exercise great care that their keys do not come into the possession of unauthorized employees. Detailed card records with signature receipts are kept. For those who desire to keep their signature receipts in this card form **TelKee** furnishes card space in the larger capacity cabinets.

TelKee also offers a very simple and effective method for those who have no such receipt practice.

A brass Receipt Holder which can hang on the hook from which the key, or keys, were issued and which can contain a signed signature receipt form, fulfills most requirements. It has the added advantage of visibility, and frequent checks can be made visually to determine that receipts have or have not been obtained.

Cross Index (See illustrations, page 173)

While the practice of die-stamping the numbers of rooms and lockers on the keys themselves has been eliminated as destroying the fundamental purpose of privacy and security, it is still too generally the practice to show on the key markers, or tags, definite descriptions of the rooms or facilities to which keys belong. In all but the most closely controlled systems, keys with markers will be purloined or go astray and if definitely marked will defeat the purpose sought. To eliminate these hazards TelKee offers and urges the general use of a code index system for the indexing and cross indexing of keys. Code indexing is the giving, to the keys to a lock, of an arbitrary number which bears no relation to an actual room or locker number.

TelKee Indexes.
1. Numerically by arbitrary code number.
2. Alphabetically by description of facility.
3. Lock serially by manufacturer's die-stamped serial number on each lock and attendant keys.

The first permits one to find to what facility any key belongs; the second, the exact position in the cabinet of any desired key; the third, where in the cabinet and to what facility any returned, or lost-and-found, key belongs.

The Code Index is positive. There is no guesswork as to where a desired key is located in the cabinet—nor where a returned key belongs. If the usual filing clerk is ill or on vacation another designated operator can immediately pick up the work without confusion or delay. Code index use increases efficiency—easy filing and easy finding. Without access to the index no irresponsible finder or holder can use a key. When a Reserve-Pattern key is sent out to have additional desired extras cut, the maker has no knowledge of the facility to which the key belongs and it is useless to cut other keys for his own use.

Code indexing also facilitates operation as changes in room numbers or cylinders in locks or location of desks or files cause no corresponding changes in location of keys in the cabinet or changes in key markers. All changes are handled in the Index. An infinite number of changes, additions or subtractions can be made with no confusion or change in the original set up.

Full and detailed instructions on the simple procedure of making up the Index and setting up the TelKee System accompany each shipment.

Miscellaneous

It is desirable that active keys in supplementary cabinets in departments have markers of a different color or shape than the ones used in the Central Key Control. TelKee permanent locking type markers are therefore made in both red and white fiber, in brass, and in both octagonal and rectangular shape. Active keys in use in departments are thereby easily distinguished from the "Reserve Pattern" Key in Central Control.

There are also advantages in further visualizing the Central Key Control with different colors in the label pockets. For this purpose TelKee furnishes color guides in five colors in transparent celluloid which can be inserted in the label pockets in front of a number label. Building maintenance keys can be distinguished as red, locker keys as green, desk keys as blue, etc.

TelKee fits into any desired method of keeping and controlling keys, whether simple or involved.

Our services are at the disposal of Architects, Contractors or Managements for consultation or to make surveys of requirements and reports of findings and suggestions.

HIGH TABLE CABINET

Designed as a less expensive cabinet than the Unit P.S. but with all its features of extreme visibility and accessibility. Specially designed triangular shaped double doors that swing from rear hinges and include the sides of the cabinet. Doors, fully opened, spread 39″.

As in the Unit P.S., panels swing on pin and socket bearings and are equipped with 100 combination hook and label pockets. Each side of the cabinet which swings with the doors is equipped inside with 50 hook and label pockets. Flexible build up capacity by panels from a minimum of four 100 hook panels (500 capacity) to a maximum of nine 100 hook panels (1000 capacity).

Regularly equipped with paracentric key in handle lock, blank or serially numbered labels and cross index book.

Designed for use on counter or table but is rigidly reinforced **to be attached to wall if desired.**

Finish—baked on enamel Olive Green. Walnut or Mahogany finish can be furnished to order.

UNIT H.T.

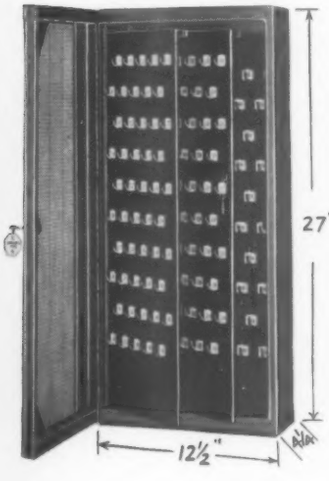
Cat. No.	No. of Panels 100 Hks.	50 Hks.	Total Hooks	Outside Dimensions
HT224	4	2	500	18 x 30½ x 12½
HT225	5	2	600	do
HT226	6	2	700	do
HT227	7	2	800	do
HT228	8	2	900	do
HT229	9	2	1000	do
HT Stand for use with above cabinets.				20 x 18 x 14½

LOW TABLE CABINET

Exactly similar in design to the H.T. except in overall height. Panels have 50 hooks and label pockets (25 each side). Insides of doors have each 25 hook and label pockets. Flexible build up capacity by panels from 300 sets of keys to 500.

UNIT L.T.

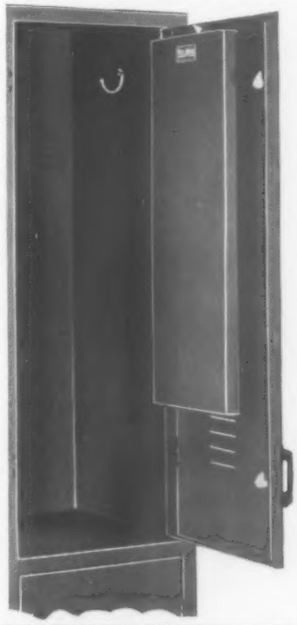
Cat. No.	No. of Panels 50 Hks.	25 Hks.	Total Hooks	Outside Dimensions
LT245	5	2	300	18 x 20¾ x 12½
LT246	6	2	350	do
LT247	7	2	400	do
LT248	8	2	450	do
LT249	9	2	500	do



WALL CABINETS UNIT W.C.

Fabricated in the same high grade furniture steel as larger cabinets. Fifty hook panel in the 75 capacity and one hundred hook panels in the 150 and 250 capacities. Paracentric key lock. 150 and 250 capacities are furnished with a tumble card cross index attached to inside of door. The 75 capacity has an alphabetical sheet index only. Includes labels for insertion in the label pockets. Finish standard Olive Green.

Cat. No.	No. of Panels	Total Hooks	Outside Dimensions
WC75	1 Swinging	75	10 x 15 x 3
WC150	1 "	150	12½ x 27 x 5
WC250	2 "	250	do



DOOR PANEL

Designed largely for use in smaller apartment houses or homes. Can be installed on the back of a closet door or in a locker. Standard 100 hook panel with latched cover and index sheet furnishes 100 hook capacity. Panel without hooks on outside and without cover furnishes 50 hook capacity.

Cat. No.	No. of Panels	Total Hooks	Outside Dimensions
DP50	1	50	9½ x 24½ x 2⅝
DP100	1	100	do

DESK OR FILE DRAWER INSERT

For use in desk drawer to accommodate a maximum of 50 departmental or home keys. Can be placed in pairs back to back in a legal width card file cabinet where requirements are less than the minimum of 600 in the TelKee Drawer File cabinet. Five 10 hook panels in an open box with TelKee key-panel holder device.

No.	Total Hooks	Dimensions
50-D	50	15 x 11 x 3⅜

MULTIPLEX PANEL ADAPTOR UNIT

For use in very large institutions where a separate locked key room is available with key custodian or for large multiplex batteries of employees' or students' lockers.

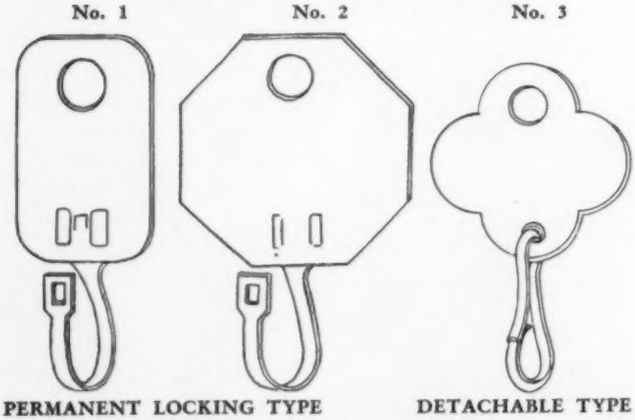
Standard 100 hook panels, 9″ wide by 25″ high, mounted on an adaptor socket bearing bar. Adaptor bars can be attached to back of locker doors or direct to key room wall.

Maximum visibility and accessibility—minimum space and cost.

Cat. No.	No. of Panels	Total Hooks	Dimensions
LA343	3	300	9 x 10 x 25
LA344	4	400	do
LA345	5	500	do

TELKEE SYSTEM ACCESSORIES

TELKEE KEY MARKERS



PERMANENT LOCKING TYPE DETACHABLE TYPE

Above illustrations show actual size

By means of the patented clasp, No. 1 and No. 2 Markers lock to the key by pressure of the thumb, giving permanent identification. TelKee Markers are made both in white or red fiber and in brass. Fiber Markers may be inscribed with ink, indelible pencil or rubber stamp, or all markers can be die stamped and enameled numerically.

Permanent Locking Type Markers should always be used to identify the Key File "Reserve Pattern Key." No. 2 Markers are furnished with die stamped legend "File Key—Must Not Be Loaned." Red fiber is preferable for pattern keys. The No. 3 detachable type Marker is for use on duplicate keys until issued as active. Durable tempered steel snap accommodates as many as three keys. Made in white fiber only.

TELKEE HOOKSTRIPS

For use in the reconditioning of present wood cabinets.

Furnished in strips of 8 combination hook and label pockets identical with combination used in TelKee cabinets except that strips are scored between combinations for easy separation by hand and are drilled for screw or tack attachment.

LABEL SHEETS

TelKee Hook Pocket Labels are made in high quality coated board, perforated in squares for easy detachment, and of exact size to fit label pockets.

Available in sheets of 100 perforated hook labels, unnumbered or serial numbering 1—5000.

RECEIPT HOLDERS

TelKee Receipt Holders, made of brass, are used to replace borrowed keys upon the Hook. Receptacle in Holder accommodates a key Receipt Form (described below) upon which is written all data pertaining to the key. In this manner every key, whether on or off the keyboard, is kept under complete control and quickly checked at all times. Page 176.

RECEIPT FORMS

BORROWER'S FORM—Provides space for writing all pertinent data pertaining to borrower of key. Form is folded and inserted in Receipt Holder, which replaces key on its Hook, furnishing complete control information on borrowed key.

COLOR GUIDES

TelKee Color Guides, of transparent celluloid, for classification and signal purposes, fit the Label Pockets of all TelKee Filing Units. Readily applied to special classification work on keyboards. Furnished in five different colors.

TelKee is in use extensively by the Federal Government, many States and Municipalities; it is in use in Office Buildings, Banks, Schools, Hospitals, Hotels, Apartment Houses, Homes and all types of Commercial Houses.

Many Architects specify TelKee for inclusion in General or Hardware Contract. It is recommended by the larger Lock Manufacturers.

Among the many users throughout the country are:

FEDERAL AND STATE

Senate and House Office Buildings ....Washington, D. C.
Department of Commerce Building ....Washington, D. C.
Post Offices and Federal Office Buildings ..... } Coast to Coast
U. S. Veteran and Marine Hospitals .. }
U. S. Supreme Court .....Washington, D. C.
Harrison County Court House .....Clarksburg, Va.
Criminal Courts Building .....Cleveland, Ohio
State Capitol Building .....St. Paul, Minn.
State Capitol Building .....Baton Rouge, La.
New York State Capitol Building .....Albany, N. Y.
State Capitol Building .....Hartford, Conn.
Norfolk State Prison Colony .....Norfolk, Mass.
Criminal Courts Building .....Chicago, Ill.
Ramsey County Court House .....St. Paul, Minn.
State Capitol Building .....Olympia, Wash.
etc., etc.

BANKS

Baltimore County .....Baltimore, Md.
Bank for Savings .....New York, N. Y.
Dime Savings .....Brooklyn, N. Y.
Federal Reserve .....Los Angeles, Calif.
Federal Reserve .....Pittsburgh, Pa.
First Central Trust .....Akron, Ohio
First National .....Oklahoma City, Okla.
Irving Trust .....New York, N. Y.
National City .....New York, N. Y.
National Newark and Essex .....Newark, N. J.
Philadelphia Savings Fund .....Philadelphia, Pa.
Pacific National .....San Francisco, Calif.
Second National .....Boston, Mass.
etc., etc.

OFFICE BUILDINGS

American Insurance Company .....Newark, N. J.
American Security & Trust .....Washington, D. C.
Board of Trade .....Chicago, Ill.
Baltimore Trust .....Baltimore, Md.
Bankers .....Milwaukee, Wisc.
du Pont .....Wilmington, Del.
Milwaukee Gas Light .....Milwaukee, Wisc.
National Red Cross .....Washington, D. C.
Northern States Power .....St. Paul, Minn.
No. 1 Wall Street .....New York, N. Y.
Professional .....Phoenix, Ariz.
Rockefeller Center .....New York, N. Y.
Shell Building .....San Francisco, Calif.
Wilshire Professional .....Los Angeles, Calif.
etc., etc.

UNIVERSITIES AND SCHOOLS

Bennington College .....Bennington, Vt.
Bard Hall, Columbia .....New York, N. Y.
College City of New York .....New York, N. Y.
College of St. Elizabeth .....Convent, N. J.
Dillard University .....New Orleans, La.
Hunter College .....New York, N. Y.
Holy Cross .....Worcester, Mass.
Howard University .....Washington, D. C.
Louisiana State University .....Baton Rouge, La.
Marquette University .....Milwaukee, Wisc.
Northwestern University .....Chicago, Ill.
Newark Public School Fine and Applied Arts .....Newark, N. J.
Ohio Wesleyan University .....Delaware, Ohio
Rollins College .....Winter Park, Fla.
State College for Women .....Tallahassee, Fla.
Sterling Memorial Library .....Yale
State Teachers College .....Morehead, Minn.
St. Mary's College and Academy .....Monroe, Mich.
University of Minnesota .....Minneapolis, Minn.
University of Southern California .....Los Angeles, Calif.
University West Virginia .....Morgantown, W. Va.

Junior, Senior and Vocational High Schools from coast to coast including:

New York, N. Y. — San Francisco, Calif.
Washington, D. C. — Newark, N. J.
Los Angeles, Calif. — Cleveland, Ohio
etc., etc.

HOSPITALS

Alleghany General .....Pittsburgh, Pa.
Bellevue .....New York, N. Y.
Barnes .....St. Louis, Mo.
Childrens Memorial .....Chicago, Ill.
Cook County Nurses Home .....Chicago, Ill.
Charity Hospital .....Baton Rouge, La.
De Paul .....St. Louis, Mo.
Fairfield State Hospital .....Newton, Conn.
Huron Road Hospital .....Cleveland, Ohio
Harbor View .....Seattle, Wash.
Hermann M. Biggs Memorial .....Binghamton, N. Y.
Jewish .....Philadelphia, Pa.
Medical Building, University of Texas..Galveston, Tex.
Margaret Hague Maternity .....Jersey City, N. J.
N. Y. Hospital, Cornell Medical School.New York, N. Y.
Ypsilanti State .....Ypsilanti, Mich.
etc., etc.

APARTMENTS AND HOTELS

Boulevard Gardens Apartment .....Long Island, N. Y.
Cedar Central Apartments .....Cleveland, Ohio
Hotel Pierre .....New York, N. Y.
Knickerbocker Village .....New York, N. Y.
London Terrace Apartments .....New York, N. Y.
Lockefield Garden Apartments .....Indianapolis, Ind.
La Salle Place .....Louisville, Ky.
New Yorker Hotel .....New York, N. Y.
Outhwaite Apartments .....Cleveland, Ohio
Prudential Insurance Co. Ironbound Development .....Newark, N. J.
Parklawn Apartments .....Milwaukee, Wisc.
Parc Vendome Apartments .....New York, N. Y.
University Apartments .....Atlanta, Ga.
Tudor City .....New York, N. Y.
etc., etc.

MISCELLANEOUS

Acacia Mutual Life Ins. Co. .....Washington, D. C.
Brooklyn Museum .....Brooklyn, N. Y.
B. Altman Department Store .....New York, N. Y.
Downtown Club .....New York, N. Y.
Folger Shakespeare Library .....Washington, D. C.
Fox-Wilshire Theatre .....Los Angeles, Calif.
Hershey Community .....Hershey, Pa.
Jacob Riis Bathing Park .....Far Rockaway, N. Y.
John Wanamaker .....Philadelphia, Pa.
Los Angeles Stock Exchange .....Los Angeles, Calif.
New York City Public Library .....New York, N. Y.
National Geographic Society .....Washington, D. C.
Northwestern Mutual Life Insurance ..Milwaukee, Wisc.
National Archives Building .....Washington, D. C.
New York Athletic Club .....New York, N. Y.
N. J. Bell Telephone Company .....Newark, N. J.
Port of New York Authority .....New York, N. Y.
Philadelphia Museum .....Philadelphia, Pa.
Pennsylvania Railroad .....Philadelphia, Pa.
104th Field Artillery .....Jamaica, N. Y.
Radio Corporation of America .....New York, N. Y.
St. Louis Globe Democrat .....St. Louis, Mo.
S. S. Kresge Administration Building..Detroit, Mich.
San Francisco Opera House .....San Francisco, Calif
The New York World's Fair of 1939 ...Flushing, N. Y.
Westinghouse .....Bloomfield, N. J.

TEL²KEE

TRADE MARK

VISIBLE KEY CONTROL SYSTEM

PRODUCT
OF
P. O. MOORE, INC.
NEW YORK

KERNER INCINERATOR COMPANY

3701 North Richards Street, Milwaukee, Wisconsin

OFFICES AND AGENCIES IN OVER 150 CITIES

PRODUCTS

KERNERATORS: For the prompt, safe, and sanitary disposal of all kinds of rubbish (including garbage) by incineration. Manufactured in four types.

Flue-fed	Retort (downdraft)
Basement-fed	Gas-fired ("Commercial")

The characteristics and advantages of each type are described below.

SCHOOL BUILDING PROBLEMS SOLVED BY KERNERATORS

SAFETY

The KERNERATOR, by providing a place designed for burning all waste eliminates the fire hazard and the smoke panic hazard inherent in the collection and storage of such waste. Even baling paper sorted from other waste is a doubtful economy. This is especially so when weighed against the possible hazard.

SANITATION AND HYGIENE

The KERNERATOR provides a convenient, sanitary, and economical method for handling all sweepings, lunch remains, garbage from cafeteria (if there is one), and all promiscuous waste.

Flues may be so located that one set of hopper doors will open into the girls' washrooms. This idea has been adopted by a number of Architects (names upon request) with very satisfactory results in actual operation.

The KERNERATOR provides a means for the disposal of sanitary waste from girls' washrooms. In so doing the KERNERATOR eliminates both the disturbance to routine, and the damage and maintenance expense of clogged drains.

ECONOMY

The KERNERATOR eliminates the expense of labor, time, and equipment in handling, storing and transporting rubbish and garbage; the necessity of daily collections of waste paper and sweepings—frequent trucking. It also cuts the cost of plumbing repairs due to drains stopped by sanitary waste in girls' washrooms.

APPLICATION

Flue-fed

This type offers the utmost in convenience, labor saving, and safety through immediate disposal of waste. The incinerator chamber in the basement is vented through a flue directly out of the top of the incinerator roof.

In this same flue, doors of a hopper type are provided at convenient locations on the floors above. These provide for disposal of all waste at the nearest possible point to the origin of the waste. Once deposited through the hopper door, the waste is contained in the incinerator designed for burning it.

This type may also be fed from the basement direct into the incinerator chamber.

Central High School, Fort Worth, Texas
W. G. Clarkson Co., Architects

Basement-fed

In existing buildings where no flue is available either large enough to provide a fallway or located conveniently for hopper doors, a basement-fed KERNERATOR provides all of the advantages except the hopper door convenience described above. In buildings without a basement and of one floor, the basement direct feeding has all the convenience and safety.

Retort (downdraft)

This type is intended for special burning problems involving the use of fuel either in the form of dry waste or commercial fuel to burn waste which will not in itself maintain combustion.

Commercial

This type of unit is a semi-portable, self-contained unit. It is primarily a slow burning garbage destructor employing gas fuel or adapted for use of soft coal fuel. Each unit is capable of handling the drained but wet garbage from 600 to 800 cafeteria meals per day.

SERVICE

The KERNERATOR is made and sold by the pioneer in the flue-fed incineration field. Satisfactory operation is guaranteed by a financially sound organization having a stable, trained corps of incinerator experts with a wide experience in school installations.

FURTHER INFORMATION

When you are planning a school building, may we send a specialist to discuss your waste disposal problems? He will be glad to recommend the proper type and size of equipment depending upon the number of rooms, number of pupils, and the height of the building.

Roxbury Latin School, West Roxbury, Boston, Mass.
Perry, Shaw & Hepburn, Architects

AMERICAN CAR AND FOUNDRY COMPANY

WOOD WORKING DIVISION

30 Church Street, New York, N. Y.

PLANT AT WILMINGTON, DEL.

HIGH GRADE CABINET WORK FROM ARCHITECT'S DESIGNS

For Colleges, Universities, Hotels, Churches, Banks, Residences and Buildings of All Kinds

Among the users of a.C.f. architectural woodcarvings will be found the following:

Architects—Ernest A. Arend; Walter J. Cope; Cram & Ferguson; Day & Klauder; Delano & Aldrich; John M. Deibert; Raleigh C. Gildersleeve; Bertram Grosvenor Goodhue; Henry F. Hornbostel; Charles A. Platt; John Russell Pope; Henry R. Sedgwick; Albert H. Spahr; Warren & Wetmore; and Zantinger, Borie & Medary.

Builders—John W. Barnes; DuPont Engineering Co., Longwood, Inc.; Mathews Construction Co.; James L. Smyth; James Stewart & Co., Inc., James L. Stuart.

Colleges and Universities—Cornell; Lehigh; Princeton; Wellesley; West Point Military Academy; Yale.

THE KINNEAR MANUFACTURING CO.

2240–2260 Fields Avenue
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Exclusively Manufacturers of Rolling Doors and Grilles

•

METAL ROLLING GRILLES

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AUTOMATIC FIRE DOORS and SHUTTERS

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STEEL ROLLING SERVICE DOORS

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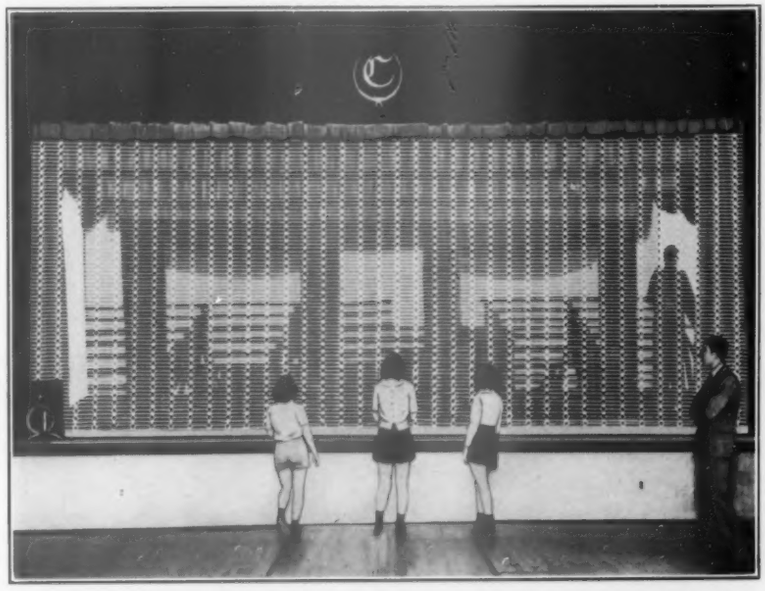
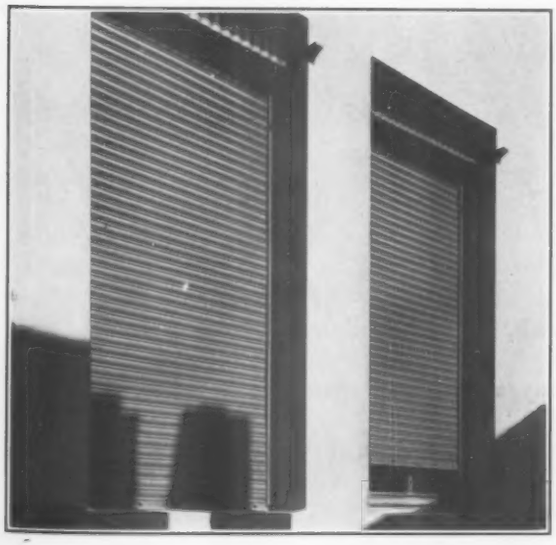
SECTIONAL UPWARD-ACTING DOORS



A Kinnear Rolling Grille over the stage in a combination gym and auditorium illustrates suitability of the Grille for closing off hallways, rooms or any other point where protection must be provided without sacrificing space, air, light, vision, or interior design

THE KINNEAR MANUFACTURING CO. pioneered and has devoted its entire effort for the past 41 years to rolling or **Upward-Acting** type Doors and Grilles. They have established the reputation throughout the world as specialists in doors that save floor and wall space, operate more conveniently, reduce maintenance expense through unusual durability and that can be built for old or new buildings for inside or outside use. Composed of a flexible metal curtain or grille which coils above the lintel, similar to a window shade, they can be installed either on the face of the wall or between the jambs when concealment of mechanism is desired. Springs provide perfect counterbalance. They can also be operated manually, mechanically or electrically.



Kinnear Doors come in two distinct classifications, Service and Fire. For the latter case, though suitable for service purposes, they are "labeled" and equipped with mechanism for automatic closure in case of fire. Where protection against trespassing alone is desired the Kinnear Grille is ideal—strong . . . attractive . . . out of sight when open . . . easy to operate . . . and admits air, light and vision.

With a nation-wide organization and the finest door manufacturing facilities Kinnear can handle any of your opening requirements with equipment that costs less to operate and maintain. Ask for a Kinnear recommendation.

BRANCH OFFICES

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New York	Pittsburgh	Chicago
Philadelphia	Cleveland	San Francisco
Washington	Cincinnati	Baltimore

AGENTS IN ALL PRINCIPAL CITIES

KINNEAR
ROLLING DOORS

Norton Door Closers

are manufactured by the

NORTON DOOR CLOSER COMPANY

Division of the Yale & Towne Mfg. Co.

2900 North Western Avenue
Chicago, Illinois

EVERY SCHOOL BUILDING has its special door control problems . . . different draft conditions, fire hazard protections, and numerous requirements for holding and closing the doors. The manner in which school installations are planned and competence in servicing are so important that Norton Door Closer Company, over a long period of years, has completed its own highly trained organization which follows through all Norton installations. Always the leader in designing and perfecting the highest type of door closing devices, Norton presents a door closer with features that are distinctive of Norton engineering. A special Norton packing nut which insures leakproof mineral oil lubrication, accurately machined working parts, complete control of the entire swing of the door which reduces strain on closer, door and hinges,—these are a few of the outstanding features.

Consult, without obligation, Norton Door Closer Company which is prepared to recommend a solution for any door control problem. Write for the Norton catalog.

NORTON DOOR CLOSERS RECENTLY INSTALLED IN:

- Western High School, Detroit, Mich.
- Dormitory "D," University of Notre Dame, South Bend, Ind.
- Southeastern High School, St. Louis, Mo.
- Chaumont High School, Chaumont, N. Y.
- Fieldhouse, Proviso Township H. S., Maywood, Ill.
- Fieldhouse, Purdue University, Lafayette, Ind.
- St. John's Lutheran School, Marysville, Ohio
- Lincoln Park District Junior H. S., Los Angeles, Calif.
- Arlington H. S., Fort Worth, Texas
- Concordia College Dormitory, Moorhead, Minn.
- Junior H. S., Ann Arbor, Mich.
- Arlington Heights School, Los Angeles, Calif.

The Norton Packing Nut

SEDGWICK MACHINE WORKS

Manufacturers of Dumb Waiters and Elevators

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REPRESENTATIVES IN PRINCIPAL CITIES

General

Sedgwick Dumb Waiters and Elevators are products of forty-five years' specialization in school and college installations throughout the country. Numerous types, sizes and capacities are available to meet different requirements and conditions. The main uses are briefly described below.

Cafeteria Service

Food supplies, dishes and other cafeteria and kitchen loads are quickly and conveniently handled from floor to floor by means of SEDGWICK Dumb Waiters. SEDGWICK Type "FDCG" Geared Automatic Brake Dumb Waiters, "Sedg-Versal" Compound Geared Dumb Waiters and SEDGWICK Electric "Roto-Waiters" are employed for this duty, depending on individual requirements.

Class-Room Service

Books, stationery, crackers and milk lunches and general school supplies are systemically sent up or down by SEDGWICK Dumb Waiters without obstructing stairways with the handling of such loads. Sedgwick Type "FDCG" Geared Automatic Brake Dumb Waiters and "Sedg-Versal" Compound Geared Dumb Waiters are usually selected.

Dormitory Service

Furniture, trunks, laundry hampers and other bulky and heavy loads are carried from floor to floor by SEDGWICK Freight Elevators or "Sedg-Versal" Compound Geared Dumb Waiters used as trunk lifts.

Infirmary Service

The Sedgwick Hand Power Hospital Elevator provides an economical and unfailing means of carrying patient on stretcher or bed. Meal trays are handled by SEDGWICK Type "FDCG" Dumb Waiters.

Laboratory Service

Supplies and apparatus are safely and easily carried from storage or receiving room to laboratory floors above by "Sedg-Versal" Compound Geared Dumb Waiters conveniently located to save time and effort.

Laundry Service

Laundry hampers and trucks are carried in many modern laundry buildings on SEDGWICK Freight Elevators, "Sedg-Versal" Compound Geared Dumb Waiters and SEDGWICK Electric "Roto-Waiters."

Library Service

Books can be sent without undue effort to the required stack levels or raised from basement storage space as required for distribution by using SEDGWICK Type "FDCG" Geared Automatic Brake Dumb Waiters or SEDGWICK Electric "Roto-Waiters."

Consultation

Our experience gained from many thousands of installations should be used in planning to best advantage installations of dumb waiters and elevators in school and college buildings. Write or telephone us for recommendations, layouts and specifications which will be gladly submitted at once.

"SEDGWICK Dumb Waiter in steel shaft using existing stairwell."

INTERNATIONAL BUSINESS MACHINES CORP.

INTERNATIONAL TIME RECORDING DIVISION

Manufacturers of Electric Time, Signal Program, Telephone, Fire Alarm and Central Control Sound Systems

WORLD HEADQUARTERS BUILDING

590 Madison Avenue, New York, N. Y.

CANADIAN DIVISION: 300 Campbell Avenue, TORONTO, ONTARIO

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Cleveland, Ohio
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Columbus, Ohio
Dallas, Tex.
Dayton, Ohio
Denver, Colo.
Des Moines, Iowa
Detroit, Mich.
El Paso, Tex.
Endicott, N. Y.
Erie, Pa.
Evansville, Ind.
Flint, Mich.
Grand Rapids, Mich.
Harrisburg, Pa.
Hartford, Conn.
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Huntington, W. Va.
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Newark, N. J.
New Orleans, La.
New York, N. Y.
Oakland, Calif.
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Omaha, Neb.
Oshkosh, Wis.
Peoria, Ill.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Me.
Portland, Ore.
Providence, R. I.
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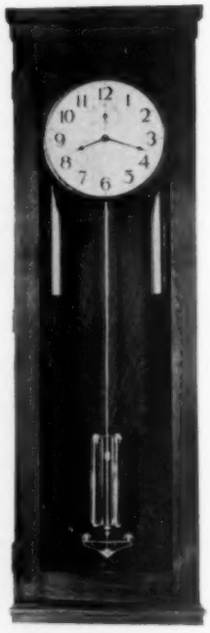
San Antonio, Tex.
San Francisco, Calif.
Scranton, Pa.
Seattle, Wash.
Shreveport, La.
South Bend, Ind.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Tulsa, Okla.
Washington, D. C.
Wheeling, W. Va.
Wichita, Kan.
Winston-Salem, N. C.
Youngstown, Ohio

International has specialized for the past half century in the design, manufacture and distribution of time recording, time indicating, and time signaling devices. A number of these have been developed specifically to meet the administrative needs of educational institutions. Many years of experience with school practice and problems place International in a position today to offer not only a wide variety of time and effort saving school equipment, but also a valuable engineering and consulting service.

ELECTRIC TIME AND PROGRAM SYSTEMS

Metal Case Secondary Clock

Time and program signaling requirements are being adequately met in practically every kind and size of school by International electric and automatic timing equipment. The same results in economy and efficiency are attained whether with a simple control device operating a few classroom bells or with a complete system of clocks, program signals, attendance time recorders, time stamps and other subsidiary timing units, operating in unison throughout one or more buildings.



International Master Clock

Marble Dial Secondary Clock

The outstanding feature of International master clock controlled systems is the Self Regulating principle of operation that automatically maintains uniform accuracy among any number of clocks, bells and other secondary timing units. Once each hour all units are automatically supervised . . . that is, they are checked or aligned for continuous agreement with the master clock. Practically all maintenance is thus eliminated. Periods are marked by audible signals and classes are moved exactly as scheduled.

A Tower Clock built to architect's specification

An entire schedule for ringing class period bells may be set up or changed quickly according to the program requirements . . . with provision for different schedules and for silencing the signals at night, over week-ends, and on holidays.

International equipment can be furnished to meet architects' specifications for designs or styles to suit individual requirements, architectural and decorative schemes. Full information on the complete line of timing equipment is available at all local offices.

An Outside Clock conforming with architect's decorative scheme

PUBLIC ADDRESS AND SOUND DISTRIBUTION SYSTEMS

Wall Type Sound Reproducer

For all places where sound must be reinforced to reach large audiences and for institutions where it is desirable to distribute sound programs simultaneously throughout a number of different rooms in one or more buildings, International provides a high quality line of sound distribution equipment. Radio, phonograph and microphone facilities may be furnished individually as required or combined in a single control instrument.

International sound distribution equipment may also be purchased in matched-finish sectional cabinets. As the demand grows, or as funds become available, extra sections may be added. Such additions do not require extra floor space.

Single Channel Central Control Unit

The sound reproducers, which assure faithful, lifelike reproduction, are available in a number of different models to meet specific acoustical and decorative requirements. Directional horns are provided for outdoor use.

Combination Clock and Sound Reproducer

INTER-ROOM TELEPHONE SYSTEMS

Cradle Type Telephone

International Telephone Systems are designed exclusively for interior communication in schools, business organizations and other similar institutions. All equipment is built to rigid specification for securing the greatest convenience and high quality service at minimum cost.

Many models of telephone instruments in both pedestal and wall types are available. Operation of all types is extremely simple, employing various kinds of control boards and push button mats. Either direct or alternating current may be used as circumstances require. Complete details supplied on request.

Telephone Push Button Mat

Wall Type Telephone

FIRE ALARM EQUIPMENT

Fire Alarm Gong

International Fire Alarm Systems provide up-to-date and effective protection for life, limb, and property. Only the latest engineering features and approved circuits are incorporated in each installation. Local regulations are strictly observed wherever an installation is made and the equipment carries the label of approval of the Underwriters Laboratories.

Break Glass Fire Alarm Station

Expert workmanship and rugged construction assure the highest quality results at moderate cost. Systems are built to meet any requirement or specification.

Data sheets are available in all International offices covering the complete range of equipment from the simplest to the more elaborate supervised and coded systems. Signal and alarm instruments, including bells, gongs, horns, and sirens in numerous models and types are provided as required.

Fire Alarm Control Panel

WORLD CLOCKS AND ATHLETIC TIMERS

International is prepared to collaborate with architects in the building of time-indicating equipment for decorative and other special purposes. The demand is most frequent for International World Clocks and Athletic Event Timers, both of which can be built to conform with a variety of specifications.

The World Clock indicates correct standard time simultaneously for all the important time zones of the world. It may be operated as an independent time piece or as a subsidiary unit in an International Electric Time System.

World Clock

The Athletic Event Timer may be installed in a variety of ways to make it easy for spectators to follow the progress of sports events. Minutes of play, playing time remaining, and period designations are clearly identified at all times. It is operated from a small control box at the official timing desk.

Consult the local International representative for complete information about these devices and all other equipment shown on these pages.

Athletic Timer

THE TEXAS COMPANY

Manufacturers of

TEXACO ROOFINGS and SHINGLES

TEXACO ROOFING DEALERS EVERYWHERE East of the Rockies

Branch Offices of The Texas Company

Atlanta, Ga.	Dallas, Texas	Denver, Colo.	Indianapolis, Ind.
New Orleans, La.	New York, N. Y.	Chicago, Ill.	(Indian Refining
Houston, Texas	Norfolk, Va.	Minneapolis, Minn.	Company)

TEXACO REG. T. M.

... ONE OF THE BEST KNOWN NAMES IN ROOFING FOR MORE THAN 27 YEARS

Natural prerequisites of roofings for school buildings are the substance and quality of the roofing products specified, the reputation and integrity of the manufacturing organization—and the ability to render unusual service in this specialized school field.

The experience of The Texas Company in the manufacture of roofings has proved repeatedly the ability of Texaco Asphalt Roofing Products to meet the most rigid requirements and specifications established for school buildings, whether in new construction or in re-roofing . . . long-lived endurance, protection, attractive appearance and lasting economy.

One simple fact is significant in understanding the high standards of quality and economy gained by using Texaco Roofings. **The Texas Company is one of the world's largest producers of asphalt . . . which is recognized as the most efficient water-proofing agent known.**

This, plus the unlimited resources and facilities of an extensive manufacturing and distributing organization, constitutes a sound reason for specifying Texaco Roofings on school buildings.

FOR COMPLETE DETAILS AND SAMPLES, COLORS AND SPECIFICATIONS SEE THE NEAREST TEXACO ROOFING DEALER OR WRITE TO THE NEAREST DISTRICT OFFICE OF THE TEXAS COMPANY.

LARGE NETWORK OF NEARBY TEXACO WAREHOUSES ASSURES "ON-SCHEDULE" OPERATIONS AND IMMEDIATE DELIVERY THROUGH TEXACO ROOFING DEALERS

School authorities knowing the widespread distribution facilities of The Texas Company have learned that they may obtain local cooperation and immediate delivery through the many Texaco Roofing Dealers and the numerous well-stocked Texaco warehouses located "nearby" for still further convenience and economy.

HOLOPHANE COMPANY, INC.

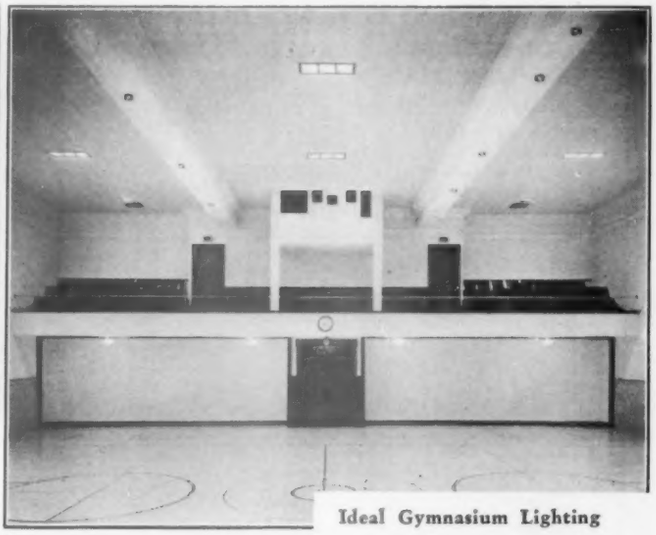
342 Madison Ave.
New York City

WORKS—Newark, Ohio

CANADIAN OFFICE: Toronto

PROGRESSIVE LIGHTING *for every school need . . .*

Modern Auditorium Lighting



Ideal Gymnasium Lighting

Special Lighting for Corridors

In-Bilt Classroom Lighting

Holophane Planned Lighting keeps pace with educational progress by conserving eyesight and promoting better work.

●

Proper lighting minimizes visual effort, increases student incentive, improves educational standards.

●

Every Holophane specific is designed to produce the greatest amount of useful light from a given investment in current and lamps.

●

For work or play—there is a Holophane lighting specific for every area in your school.

V **A highly specialized engineering department**
V **is maintained for the purpose of giving free**
V **planning and specification service on lighting . . . Just state your problem, and leave the rest to Holophane.**

HOLOPHANE
PLANNED LIGHTING
PRODUCES THE GREATEST AMOUNT OF USEFUL LIGHT

JOHN E. LINGO & SON, INC.

Established 1897

Manufacturers of

Metal Flagpoles

29th Street & Buren Avenue

Camden, New Jersey

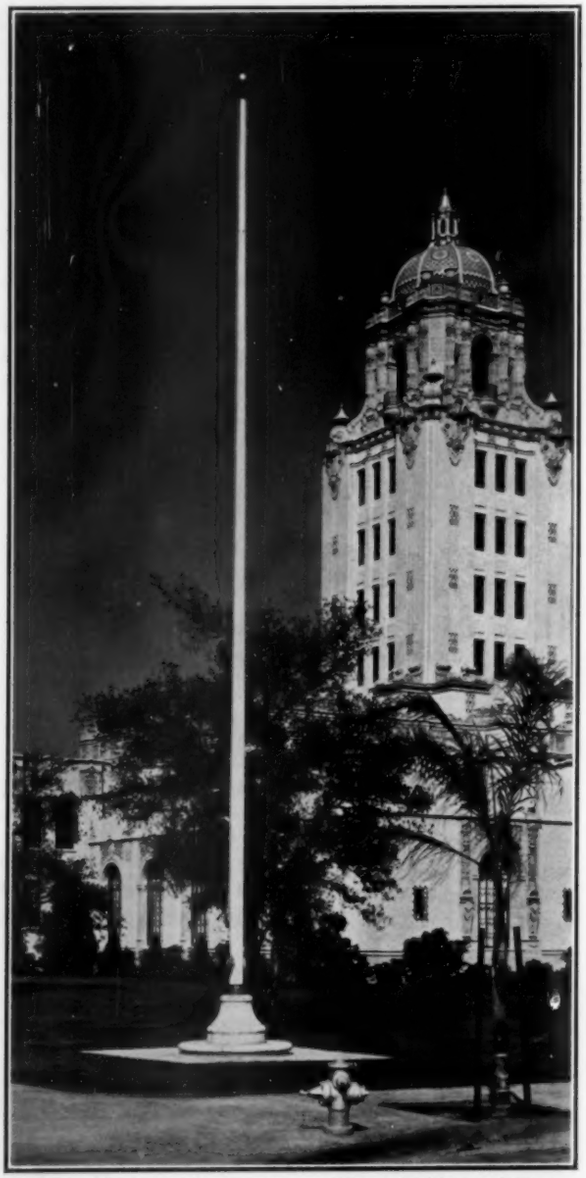
Telephone: Camden 487

TWO DISTINCT TYPES OF STEEL FLAGPOLES

CONTINUOUS STRAIGHT TAPERED FLAGPOLES

Continuous Straight Tapered flagpoles are made of high grade open hearth steel, have a smooth uninterrupted exterior surface throughout without visible joints and offsets, and resemble a finished wooden flagpole in appearance. They are standardized for ground and roof settings in lengths from 20 ft. to 100 ft. These poles are carried in stock and prompt shipments can be made. They are usually shipped in one piece without field joints. To avoid high freight costs, long poles of this type are shipped in two pieces with a machined fit field joint. The erector merely pushes the two sections together at the erection site, welds a small circumferential bead at the joint and then files or grinds the bead smooth, giving the pole an unbroken exterior surface throughout.

Continuous Straight Tapered steel flagpoles are ideal as replacements of wooden flagpoles, for not only is the appearance the same but the steel pole affords lightning protection, unlimited life and dependability not usually found in a wooden flagpole.



50 Feet Above Grade, Continuous Straight Tapered Heavy Type Steel Flagpole, City Hall, Beverly Hills, Calif.

SWAGED SECTIONAL FLAGPOLES

Swaged Sectional flagpoles are fabricated in sections of copper bearing seamless steel pipe with swaged, telescoped and shrunk joints without the use of bolts, rivets, pins, screw couplings or lead calking. They are standardized for ground and roof settings in lengths from 15 ft. to 125 ft. These poles are carried in stock and shipped in knocked down sections with field joints. The erector merely pushes or telescopes the knock-down sections together at the erection site and after the pole is erected the field joints are made airtight and watertight by calking steel to steel with an ordinary hammer and calking chisel.

OTHER PRODUCTS

We also manufacture Continuous Entasis Tapered Copper Bearing Steel, Stainless Steel, Bronze, Nickel Silver and Aluminum flagpoles, standardized for ground or roof settings in various heights and diameters. These poles are especially suitable for monuments, memorials and other buildings of exceptional architectural design. Poles of this type are also standardized for window or outrigger settings.

CATALOGS AND SERVICE

Catalog and Pamphlets giving full information, details, specifications, prices, etc., gladly mailed on application.

Our Engineering Department will gladly assist you in planning your contemplated flagpole installations most satisfactorily and economically, and without obligation on your part whatsoever.

WARNING!

In the interest of safety and for the protection of life and property, we implore Officials to rigidly inspect immediately all their flagpoles now in use.

A wooden flagpole which appears perfect on the outside can be so deteriorated on the inside that only a shell remains and is likely to fall in the next heavy wind. A perfect wooden flagpole offers no resistance to lightning and can readily be destroyed in the next thunder storm.

A steel flagpole improperly designed can fall in a heavy wind or snap off if joined together with screw couplings, flanges, etc.

Protect your property, the general public and particularly children, by removing these hazards now!

Insure against falling poles by installing "LINGO" steel flagpoles. They are properly designed, constructed to safely withstand winds of hurricane force and are natural lightning protectors.

Inspection of Your Flagpoles Now May Save Lives Later!

SECTION III
ARCHITECTS FOR EDUCATIONAL BUILDINGS

All the architects listed in this Directory are now at work on educational buildings or have designed a number of school and college buildings in recent years.

No attempt has been made to evaluate the skill or professional standing of the architects listed. Boards of Education and persons interested in the construction of new buildings can obtain valuable advice in this matter from the presidents of the local chapters of the American Institute of Architects, or from the national headquarters of that organization, The Octagon, Washington, D. C., and from such sources as the National Advisory Council on School Buildings, the United States Office of Education, the respective state departments of education, the Department of Education of the National Catholic Welfare Conference, and the Department of Educational Administration of Teachers College, Columbia University, New York.

Alabama

Birmingham

Charles H. McCauley, Jackson Bldg.
Miller, Martin & Lewis, Title Guarantee Bldg.
W. A. Rayfield & Co., 328 St. George St., S.
Jack B. Smith, Steiner Bank Bldg.
Warren, Knight & Davis, Protective Life Bldg.

Florence

Ben F. Riley, III, 115 E. Mobile St.

Gadsden

Paul W. Hofferbert, 220 S. 8th St.

Montgomery

Ausfeld & Jones, Shepherd Bldg.
Dittmar & Roberts, Vandiver Bldg.
Earle G. Lutz, Jr., 313 Catoma St.

Tuskegee Institute

Louis E. Fry, Box 566

Arizona

Phoenix

Lescher & Mahoney, Title & Trust Bldg.

Tucson

Roy W. Place, 11 E. Pennington St.

Arkansas

Fort Smith

Haralson & Mott, Merchants Bank Bldg.
E. Chester Nelson, Merchants Bank Bldg.

Little Rock

Brueggeman, Swaim & Allen, Gazette Bldg.
Erhart & Eichenbaum, Gem Bldg.
A. N. McAninch, Pyramid Life Bldg.
Thompson, Sanders & Ginocchio, Hall Bldg.
Wittenberg & Delony, Southern Bldg.

California

Alhambra

Scott Quintin, Edison Bldg.
John Walker Smart, 39 E. Main St.

Altadena

William J. Stone, 736 W. Mariposa St.

Bakersfield

Charles H. Biggar, Haberfelde Bldg.
Symmes & Willard, Haberfelde Bldg.

Berkeley

John J. Donovan, 950 Parker St.
P. L. Dragon & C. R. Schmidts, 2068 Allston Way
W. H. Ratcliff, American Trust Bldg.

Beverly Hills

Donald Beach Kirby, 143 S. Beverly Dr.

Chico

Chester Cole

Del Monte

Robert Stanton

Fresno

W. D. Coates, Rowell Bldg.
Franklin & Kump, Patterson Bldg.
Edward Glass, Mattei Bldg.
David Horn, Rowell Bldg.
H. Rafael Lake, Mattei Bldg.
Perrine & Mackie, Patterson Bldg. (also in Los Angeles)
Fred L. Swartz, Brix Bldg.

Fullerton

Harry K. Vaughn, 324 E. Wilshire St.

Hollywood

H. L. Gogerty, 6272 Yucca St.
Theodore R. Jacobs, 1605 N. Cahoenga Blvd.

Long Beach

Clarence N. Aldrich, 1834 Dawson Ave.
W. Horace Austin, 532 Chestnut Ave.
Kirtland Cutter, F. & M. Bank Bldg.
Hugh R. Davies, 430 E. Ocean Blvd.
Warren Dedrick, Heartwell Bldg.
D. Easton Herrald, 1st National Bank Bldg.
George W. Kahrs, 1224 Linden Ave.
Roger K. Nissen, 345 Carroll Park West
Schilling & Schilling, 151 Linden Ave.
Victor E. Siebert, 120 E. 3rd St.
H. C. Wildman, 3710 Lime Ave.
Kenneth S. Wing, 501 Termino Ave.

Los Angeles

George J. Adams, 5514 Wilshire Blvd.
Allison & Allison, Edison Bldg.
John C. Austin, 1151 S. Broadway
C. A. Balch, 1584 W. Washington Blvd.
M. L. Barker & G. Lawrence Ott, 624 S. LaBrea Ave.
Richard M. Bates, Jr.
Orville L. Clark, 369 N. Ridgewood Pl.
John M. & Thomas R. Cooper, 6241 W. 6th St.
Harold Cross, 124 W. 4th St.
Walter S. Davis, 2400 N. Highland St.
Louis Dorr & Dwight Gibbs, 816 W. 5th St.
Wesley Eager, 816 W. 5th St.
Ralph C. Flewelling, 816 W. 5th St.
Gable & Wyant, 3723 Wilshire Blvd.
Grant & Bruner, Ferguson Bldg.
Albert E. Hansen, 2511 Wilshire Blvd.
William H. Harrison, 816 W. 5th St.
Earl Heitschmidt, 417 S. Hill St.
Hibbard, Gerity & Kerton, 816 W. 5th St.
Frank D. Hudson, 315 S. Broadway
Myron Hunt & H. C. Chambers, 408 S. Spring St.
Arthur R. Hutchason, 816 W. 5th St.
Charles M. Hutchison, 108 W. 6th St.
Harold Johnson, Architects Bldg.
Joseph Kaiser, 5849 S. Van Ness Ave.
Office of Gordon B. Kaufman, 627 S. Carondelet St.
William V. Kernan, 111 W. 7th St.
Paul Kingsbury, 516 N. Gower St.
T. C. Kistner, Architects Bldg.
Marshall R. Lawson, 424 S. Broadway
George M. Lindsey, 6305 Yucca St.
Samuel E. Lunden, 458 S. Spring St.
Marsh, Smith & Powell, Architects Bldg.
Marcus P. Miller, Board of Trade Bldg.
Armand Monaco, 3021 Waverly Dr.
Morgan, Walls & Clements, Van Nuys Bldg.
Arthur C. Munson, 433 S. Spring St.
Richard J. Neutra, 2348 Silverlake Blvd.
Raphael A. Nicolais, 5670 Wilshire Blvd.
C. E. Noerenberg, Los Angeles Railway Bldg.
Elwin P. Norberg, Board of Education
Llewellyn A. Parker, Architects Bldg.
John & Donald B. Parkinson, 433 S. Spring St.
Perrine & Mackie (also in Fresno)
Harry L. Pierce, 1443 Mt. Pleasant St.
Plummer, Wurdeman & Becket, 621 S. Hope St.
Alfred W. Rea & Chas. E. Garstang, 215 W. 6th St.
Winchton L. Risley, 220 S. Westmoreland Ave.
A. F. Rosenheim, Chamber of Commerce Bldg.
W. F. Ruck, 940 S. Figueroa St.
W. J. and K. M. Saunders, 785 E. Pico St.
Frank R. Schaefer, 560 S. Main St.
Harold O. Sexsmith, 6636 Hollywood Blvd.
C. F. Skilling, 2600 S. Hoover St.
Lester T. Squiers, Union League Bldg.
Edward Cray Taylor & Ellis Wing Taylor, 803 W. 3rd St.
Train & Cressey, 321 W. 3rd St.
Gene Verge, 1709 W. 8th St.
Walker & Eisen, Pacific Commerce Bldg.
Carleton Monroe Winslow, Architects Bldg.
A. C. Zimmerman, Hellman Bldg.

Los Gatos

E. P. Whitman, 54 Cleland Ave.

Monrovia

Robert M. Finlayson, Central Bldg.

Oakland

Will G. Corlett, Bank of America Bldg.

Palo Alto

B. M. Clark & David B. Clark, 310 University Ave.

Pasadena

Robert H. Ainsworth, Central Bldg.
Walter C. Folland, 224 S. Oak Knoll Ave.
Elmer Grey, 170 E. California St.
Frederick Kennedy, Jr., 1041 E. Green St.
Marston & Maybury, 25 S. Euclid Ave.

Petaluma

Brainerd Jones, 226 Washington St.

Rancho Santa Fe

Lilian J. Rice

Richmond

Keith O. Narbett, 468 31st St.

Riverside
G. Stanley Wilson

Sacramento
W. E. Coffman, Forum Bldg.
Charles F. Dean, 10th & J Sts.
Harry J. Devine, Cronan Bldg.
George C. Sellon, California State Life Bldg.
Starks & Flanders, Bank of America

Salinas
Charles E. Butner, 7 Winham St.
C. J. Ryland, Salinas National Bank Bldg.

San Bernardino
Howard E. Jones, Citizens National Bank Bldg.
E. Charles Parke, Fuller Bldg.
Martin C. Parker, Citizens National Bank Bldg.
Worswick & Culver, Fuller Bldg.

San Diego
H. Louis Bodmer, Commonwealth Bldg.
Louis J. Gill, Sefton Bldg.
Frank L. Hope, Jr., San Diego Trust & Savings Bldg.
Jackson & Hamill, Bank of America Bldg.
Kistner & Curtis, Spreckels Bldg.
William P. Lodge, Fifth Avenue Bldg.
John S. Siebert, Granger Bldg.
F. W. Stevenson, Spreckels Bldg.
William H. Wheeler, Commercial Bank Bldg.

San Francisco
Arthur Brown, Jr., 251 Kearny St.
Norman R. Coulter, 46 Kearny St.
Mark Daniels, 101 Post St.
Edward A. Eames, 216 Pine St.
Thos. M. Edwards, 9 Geary St.
Henry H. Gutterson, 526 Powell St.
Wm. C. Hays
G. Albert Lansburgh, 321 Bush St.
Masten & Hurd, 233 Post St.
Maybeck & White, 235 Montgomery St.
William Mooser, 244 Kearney St.
E. L. Norberg, 580 Market St.
Timothy L. Pflueger, 580 Market St.
Frederick H. Reimers, 233 Post St.
Resing & McGuinness, 488 Pine St.
Martin Rist, Phelan Bldg.
N. W. Sexton, De Young Bldg.
Henry C. Smith, 3867 Sacramento St.
William H. and Harold H. Weeks, 593 Market St.

Santa Ana
Austin & Wildman, Spurgeon Bldg.
Fay R. Spangler, Spurgeon Bldg.

Santa Barbara
E. Keith Lockard, 117 E. De la Guerra St.
Soule & Murphy, 116 East Sola St.

Santa Paula
Roy C. Wilson, Box 941

Santa Rosa
C. A. Caulkins, Jr., Rosenberg Bldg.
William Herbert, Rosenberg Bldg.

South Pasadena
A. S. Nibecker, Jr., 1624 Bushnell Ave.

Stockton
Elmore G. Ernst, 9 W. Cleveland St.
Victor Galbraith
Frank V. Mayo, 931 N. Eldorado St.
Peter L. Sala, 2130 N. Commerce St.

Ventura
Harold E. Burket, 468 E. Main St.

Watsonville
A. W. Story, P. V. Bank Bldg.

Whittier
R. L. Warren, 115 E. Philadelphia St.

Wilmar
J. A. Larralde, 2231 Del Mar Ave.

Colorado

Boulder
G. H. Huntington, Citizens Bank Bldg.

Denver
Paul Atchison, 1254 Monaco Pkwy.
J. B. Benedict, 1669 Broadway
William N. Bowman, Inc., Insurance Bldg.
T. H. Buell & Co., 730 14th St.
H. W. J. Edbrooke, Tabor Bldg.
M. S. Fallis Architect Co., 624 Ogden St.
W. E. and A. A. Fisher, Denver National Bldg.
Robert K. Fuller, Insurance Bldg.
Eugene G. Groves, Temple Court Bldg.
F. W. Ireland, Jr., 1145 St. Paul St.
Morris & Frewen, Midland Savings Bldg.
C. Francis Pillsbury, Midland Savings Bldg.
Gordon D. White, 615 Columbine St.

Grand Junction
J. Lewis Ford, 122 N. 6th St.

Pueblo
Walter DeMordaunt, Thatcher Bldg.
John Gray, 612 Van Buren St.

Trinidad
Francis W. Spencer & Roy W. Vorhees, Turner Bldg.

Connecticut

Bridgeport
Frederick H. Beckwith, 19 Arcade Balcony

Danbury
P. N. Sunderland, Inc., 81 West St.

Hartford
Isaac A. Allen & Son, Inc., 100 Farmington Ave.
Golden, Storrs & Co., 343 Fairfield Ave.
S. W. Haynes & Associates, 36 Pearl St. (also in Fitchburg, Mass.)
Wm. D. Johnson, 174 Bond St.
Carl J. Malmfeldt, 36 Pearl St.
William T. Marchant, 36 Pearl St.
John J. McMahon, 187 Barker St.
Frank Warren Whiton, 550 Main St.

Litchfield
Ernest Sibley

Meriden
Lorenzo Hamilton, 137 Colony St.

Middletown
Lamb & Segerberg, 438 Main St.
Wm. Thomas Towner, 164 Court St.

New Haven
R. W. Foote, 185 Church St.
Joseph A. Jackson, 184 Livingston St.
Norton & Townsend, 405 Temple St.

New London
A. Graham Creighton, 140 State St.
Payne & Keefe, Manwaring Bldg.

Stamford
William J. Provoost & Richard Everett, Jr., 421 Main St.

Waterbury
Louis A. Walsh, 111 W. Main St.

Delaware

Wilmington
Brown & Whiteside, DuPont Bldg.
Wallace E. Hance, 1222 Market St.
Martin & Jeffers, Inc., DuPont Bldg.
Massena & DuPont, 704 Delaware Ave.
Robinson, Stanhope & Manning, Equitable Bldg.

District of Columbia

Washington
Rhees E. Burket, 726 Jackson Pl.
Albert I. Cassell, Howard University
H. W. Cutler, 1108 16th St., N. W.
Waldron Faulkner, 917 15th St.
Philip H. Frohman, 726 Jackson Pl.
Philip M. Jullien & Co., Southern Bldg.
Fred V. Murphy, 1413 H St.
Robinson & Williams, 1927 11th St.
Upman & Adams, 808 17th St.
Nathan C. Wyeth, Municipal Architect, District Bldg.

Florida

Daytona Beach
Harry M. Griffin, 309 N. Grandview Ave.

Fort Myers
Nat Gaillard Walker, 1127 First St.

Gainesville
Rudolph Weaver, University of Florida

Hollywood
Bayard C. Lukens

Jacksonville
S. Ralph Fetner, 218 W. Church St.
Max L. Worthley, 605 Ocean St.

Miami
Kiehnel & Elliott, Seybold Bldg.

Miami Beach
August Geiger, 731 Lincoln Rd.
E. L. Robertson, 1680 Alton Rd.

Ocala
Frank A. Parziale, Robertson Bldg.

Orlando
Maurice E. Kressly, 752 Palm Dr.
W. Kenneth Miller, 206 Washington Street Arcade

Pensacola
S. J. Welch, 1306 E. Jackson St.
Yonge & Hart

St. Petersburg
Philip F. Kennard, Empire Bldg.
Henry L. Taylor, Empire Bldg.

Stuart
Bert D. Keck, Krueger St.

Tallahassee
T. Angus MacEwan, 546 W. College Ave.

Georgia

Athens
Roy E. Hitchcock, University of Georgia

Atlanta
Bush-Brown, Gailey & Assoc., Georgia School of Technology
Wm. J. J. Chase, 140 Peachtree St.
Daniell & Beutell, Georgia Savings Bank Bldg.
Edwards & Sayward, 101 Marietta Street Bldg.
Chas. H. Hopson & Ross H. Howard, Associate, Healey Bldg.
Ivey & Crook, Candler Bldg.
Henry H. Jordan, Healey Bldg.
Alvin Roger Moore, C. & S. Bank Bldg.
R. Kennon Perry, Mortgage Guarantee Bldg.
Otis Clay Poundstone, 101 Marietta St.
G. Floyd Preacher & Associates, 56 Roxboro Rd.
Arthur Neal Robinson, Henry Grady Bldg.
Tucker & Howell, Rhodes Haverty Bldg.
Eugene C. Wachendorff, 811 Peachtree St., N.E.
Jess Wilhoit, Mortgage Guarantee Bldg.

Augusta
F. Arthur Hazard, Masonic Bldg.
Willis Irvin, S. F. C. Bldg.
Merry & Parsons, S. F. C. Bldg.
Scroggs & Ewing, S. F. C. Bldg.

Columbus
F. Roy Duncan, 3119 Hamilton Ave.
T. F. Lockwood, Murrah Bldg.

Macon
Dennis & Dennis, 556 Mulberry St.
W. Elliott Dunwody, Jr., 460 Broadway
Ellamae Ellis League, Grand Bldg.

Rome
Bayard L. Barnwell

Savannah
Cletus W. Bergen, Liberty Bank Bldg.
Levy & Clarke, 203 E. Broughton St.
Walter P. Marshall, 1108 E. Henry St.

Idaho

Boise
Ernest H. Gates, P. O. Box 1943
Tourtellotte & Hummel, Eastman Bldg.
Wayland & Fennell, Box 1277

Idaho Falls
Sundberg & Sundberg

Lewiston
Hugh Richardson, Weisgerber Bldg.

Nampa
Lee R. Cooke, 1222 1st St., S.

Pocatello
Frank H. Paradice, Jr., Pourtneuf Bldg.

Twin Falls
Burton E. Morse, Fidelity National Bank Bldg.

Illinois

Alton
James M. Maupin, Commercial Bldg.
L. Pfeiffenberger's Sons, 102 W. 3rd St.

Aurora
Frank B. Gray, 73 S. LaSalle St.
W. J. van der Meer & A. J. Mann Co., Terminal Bldg.

Belleville
Rubach & Weisenstein, Belleville Bank & Trust Bldg.

Bloomington
Lundeen & Roozen, Corn Belt Bank Bldg.
Schaeffer & Hooton, Peoples Bank Bldg.

Cardondale
Thos. S. Thompson, Box 123

Champaign
F. E. Berger & R. L. Kelley, 44 Main St.
George E. Ramey & Co., Robeson Bldg.

Chicago
Alfred P. Allen & Maurice Webster, Assoc., 225 N. Michigan Ave.
Burnham & Hammond, Inc., 160 N. LaSalle St.
Melville C. Chatten, 160 N. LaSalle St.
Childs & Smith, 430 N. Michigan Ave.
John C. Christensen, Board of Education, 228 N. LaSalle St.
John D. Chubb, 109 N. Dearborn St.
Edwin H. Clark, 8 E. Huron St.
George G. Elmslie, 122 S. Michigan Ave.
Granger & Bollenbacher, 333 N. Michigan Ave.
Hamilton, Fellows & Nedved, 814 Tower Court
Albert Frederic Heino, 11059 Hale Ave.
Charles Hodgdon & Son, 111 W. Monroe St.
Holabird & Root, 333 N. Michigan Ave.
Holmes & Flinn, 8 S. Dearborn St.
Holsman & Holsman, 140 S. Dearborn St.
Godfrey E. Larson Inc., 77 W. Washington St.
Joseph C. Llewellyn Co., 38 S. Dearborn St.
Edgar Martin, 540 N. Michigan Ave.
Benj. Franklin Olson, 19 S. LaSalle St.
Perkins, Wheeler & Will, 225 N. Michigan Ave.
Clement L. Piontek, 1608 Milwaukee Ave.
James B. Rezny & Adrian Rezny, 2202 S. Crawford Ave.
E. E. Roberts & Elmer C. Roberts, Inc., 82 W. Washington St.
Monroe R. Sandel, 10 E. Huron St.

Danville
Liese & Ludwick, Temple Bldg.

Decatur
S. A. Clausen, Standard Bldg.
Charles Harris, Standard Office Bldg.
F. E. Holmstrand, Decatur Club Bldg.

East St. Louis
John W. Kennedy, First National Bank Bldg.

Elgin
Leroy W. Thompson, 735 St. John St.

Galesburg
Aldrich & Aldrich, Bondi Bldg.

Highland
Knoebel & Pabst, State & Trust Bank Bldg.

Highland Park
John S. Van Bergen, 234 Cedar Ave.

Joliet
Webster Tomlinson, Morris Bldg.

Kewanee
John A. Scribbins, 611 Tremont St.

Lake Forest
Anderson & Ticknor, Inc., 262 E. Deerpath Ave.

La Salle
John Hanifen, 225 Gooding St.

Lincoln
J. M. Deal, Box 406

Maywood
John A. Chiaro, 12 N. 5th Ave.

Metropolis
S. Lester Daly

Moline
M. R. Beckstrom, Reliance Bldg.
William H. Schulzke, Fifth Avenue Bldg.

Mt. Vernon
William R. McCoy, First National Bank Bldg.

Murphysboro
R. Z. Gill & Co., 1328½ Walnut St.

Ottawa
Louis H. Gerding, 708 LaSalle St.

Park Ridge
W. F. McCaughey, 3 S. Prospect Ave.

Peoria
Hamilton B. Dox, Lehmann Bldg.
Hewitt, Emerson & Gregg
Jameson & Harrison, Alliance Life Bldg.

Rockford
Bradley & Bradley, Brown Bldg.
Raymond A. Orput, Third National Bank Bldg.
Peterson & Johnson

Rock Island
Cervin & Stuhr, Safety Bldg.
Benj. A. Horn, Rock Island Bank Bldg.

Springfield
Harry J. Reiger, Security Bldg.

Urbana
Royer & Danley, 209 S. Broadway
Smith, Kratz & Strong, 101 S. Broadway

Waukegan
Ekstrand & Schad, 100 S. Genesee St.
Wilbur A. Mullin, 5 N. Genesee St.

Indiana

Anderson
E. F. Miller, Anderson Bank Bldg.
Ernest R. Watkins, Citizens Bank Bldg.

Bedford
O. L. Hill, Box 274

Bloomington
Wm. J. Strain, 104½ E. 5th St.

Connersville
Henkel & Hanson, Thornburg Bldg.

Crawfordsville
Carroll O. Beeson, Ben Hur Bldg.

Crown Point
Turner & Bohling, 116 N. East St.

Dana
H. L. Fillinger, First National Bank Bldg.

Elkhart
Gerald C. Brubaker, 360 Goshen Ave.

Evansville
Edwin C. Berendes, 121 N. W. 4th St.
Harry E. Boyle & Co.
Edward J. Thole, Furniture Bldg.
Charles L. Troutman, American Trust Bldg.

Fort Wayne
Le Roy Bradley, 221 W. Wayne St.
Griffith & Goodrich, 206 E. Jefferson St.

Frankfort
Leonard & Wolf, 241 Ross Block

Gary
Joe H. Wildermuth & Co., 527 Broadway

Hammond
W. S. Hutton, 5231 Hohman Ave.

Huntington
Robert W. Stevens, 1033 Cherry St.

Indianapolis
D. A. Bohlen & Son, Majestic Bldg.
Everett I. Brown, Fidelity Trust Bldg.
Burns & James, 333 N. Pennsylvania St.
Robert F. Daggett, 445 N. Pennsylvania St.
Russell N. Edwards, 157 E. 71st St.
Herbert Foltz & Son, Architects Bldg.
McGuire & Shook, Fletcher Trust Bldg.
Geo. F. Schreiber, 2915 N. Pennsylvania St.
C. D. J. Zimmerman & Associates, 3538 N. Meridian St.

Kentland
John A. Bruck

Lafayette
Frank P. Riedel, 716 S. 12th St.
Walter Scholer, 1114 State St.

La Porte
George W. Allen, Savings Bank Bldg.

Lowell
M. Clifford Wiley

Muncie
Garrard & Keely, 118-A E. Adams St.
Houck & Hamilton, Patterson Bldg.

New Albany
Hawkins & Walker, Elsby Bldg.

Notre Dame
Francis W. Kervick, University of Notre Dame

Richmond
Werking & Son, 2000 E. Main St.

South Bend
Austin & Shambleau, J. M. S. Bldg.
Willard M. Ellwood, Christman Bldg.
R. V. & H. V. Maurer, 107 Lincoln Way, E.
Callix E. Miller, Union Trust Bldg.
Ernest W. Young, Sherland Bldg.

Terre Haute
Miller & Yeager, Opera House Bldg.

Vincennes
Sutton & Routt, Citizens Trust Bldg.

Iowa

Ames
Allen Holmes Kimball, 213 Engineering Annex

Burlington
Robin B. Carswell, Iowa State Bank Bldg.

Cedar Rapids
W. J. Brown, Higley Bldg.
Norman Hatton, Higley Bldg.

Council Bluffs
J. Chris Jensen, 305 Broadway

Davenport
Arthur H. Ebeling, Kahl Bldg.
Kruse & Klein, Kahl Bldg.
Howard S. Muesse, Davenport Bank Bldg.
Seth J. Temple, Union Bank Bldg.

Decorah
Charles Altfillisch, 126½ W. Water St.

Des Moines
Dougher, Rich & Woodburn, Old Colony Bldg.
Keffer & Jones, Masonic Temple.
William N. Nielsen, Securities Bldg.
Proudfoot, Rawson, Brooks & Borg, Hubbell Bldg.
Oren Thomas, Des Moines Bldg.
Tinsley, McBroom & Higgins, Hubbell Bldg.

Dubuque
C. I. Krajewski, Roshek Bldg.

Forest City
Thorwald Thorson

Fort Dodge
E. O. Damon, East Mason Bldg.
Frank W. Griffith, Snell Bldg.

Mason City
Hansen & Waggoner, 11½ S. Federal Ave.

Ottumwa
George M. Kerns, 211 E. 2nd St.

Sioux City
Beuttler & Arnold, Insurance Exchange Bldg.
Geo. B. Hilgers, Warnock Bldg.
E. R. Swanson, Insurance Exchange Bldg.

Waterloo
M. B. Cleveland, 424 E. 4th St.

Kansas

Abilene
Murray & Cayton, Citizens Bank Bldg.

Hutchinson
Otho McCrackin, 308 W. 20th St.
Mann & Co., Wiley Bldg.
Smith & English, Nelson Bldg.

Iola
Garrold A. Griffin, 501 S. Washington St.

Kansas City
D. B. Peterson, 721 Minnesota Ave.
Jos. W. Radotinsky, Commercial National Bank

Lawrence
Thomas Larrick, 1021 Massachusetts St.

Manhattan
Paul Weigel, Kansas State College

Ottawa
Washburn & Stookey, 222½ S. Main St.

Salina
Ben H. Byrnes, National Bank of America Bldg.
Chas. W. Shaver, United Life Bldg.

Topeka
Raymond A. Coolidge, State Architect
Cuthbert & Suehrk, 735 Kansas Ave.
Ray L. Gamble, Central Bldg.
W. E. Glover, National Reserve Bldg.
Ralph E. Scamell, National Reserve Bldg.
Thos. W. Williamson Co., National Bank Bldg.

Wichita
Ed. Forsblom, Beacon Bldg.
R. J. Hamilton, Brown Bldg.
Overend & Boucher, Brown Bldg.
Lorentz Schmidt, 1805 E. 2nd St.
Glen H. Thomas, 125½ N. Topeka Ave.
S. S. Voight, 522 S. Broadway

Kentucky

Ashland
Hayes & Lusk, Second National Bank

Covington
B. T. Wisenall, First National Bank

Frankfort
Leo L. Oberwarth & Sons, 301 W. 2nd St.

Hopkinsville
John T. Waller, 1700 S. Virginia St.

Lexington
Wm. B. Brock, City Bank Bldg.
H. A. Churchill, Citizens Bank Bldg.
Frankel & Curtis, McClelland Bldg.
John T. Gillig, Walton Bldg.
Whayne W. Haffer, 414 Fayette Park
Hugh Meriwether, Walton Bldg.
John F. Wilson, 131 W. Short St.

Louisville
Archer & Dean, Coalman Bldg. (also in Huntington, W. Va.)
Brinton B. Davis, Washington Bldg.
Carl J. Epping, 806 E. Broadway
O. W. Holmes, 3537 River Park Drive
E. T. Hutchings, Heyburn Bldg.
Joseph & Joseph, Breslin Bldg.
D. X. Murphy & Bro., Louisville Trust Bldg.
Arthur G. Tafel, 140 S. 3rd St.

Madisonville
Lawrence Casner

Owensboro
Walter Scott Roberts, Masonic Bldg.

Paducah
G. Tandy Smith, Jr., Box 705

Louisiana

Alexandria
C. Errol Barron, Guaranty Bank Bldg.
Herman J. Duncan & Co., Inc., Rapides Bank Bldg.
Max J. Heinberg, Weil Bldg.
Charles T. Roberts, Guaranty Bank Bldg.

Baton Rouge
Bodman & Murrell, Reymond Bldg.

Monroe
H. H. Land, Ouachita Bank Bldg.
J. W. Smith & Associates, Ouachita Bank Bldg.

New Orleans
William R. Burk, 7831 Plum St.
Edgar A. Christy, Orleans Parish School Board
Favrot & Reed, Nola Bldg.
Moise H. Goldstein, American Bank Bldg.
William T. Nolan, Queen & Crescent Bldg.
Allison Owen, Canal Bank Bldg.
Weiss, Dreyfous & Seiferth, Maison Blanche Bldg.
Wogan & Bernard, 318 Carondelet St.

Shreveport
Jones, Roessle, Olschner & Wiener, Ardis Bldg.
Edward F. Neild, City Bank Bldg.
Seymour Van Os, Ricou-Brewster Bldg.

Winnsboro
John W. Baker

Maine

Augusta
Bunker & Savage, 256 Water St.

Bangor
Crowell & Lancaster, 6 State St.

Lewiston
Harry S. Coombs & Alonzo J. Harriman, 11 Lisbon St.

Portland
Miller & Beal, Inc., 465 Congress St.
John Calvin & John H. Stevens, 187 Middle St.
John P. Thomas, 537 Congress St.

Presque Isle
John C. Levasseur, Main St.

Maryland

Baltimore
O. Eugene Adams, 509 Edgevale Rd., Roland Park
J. A. Ahlers, Roland Park Co., 481 Roland Ave.
Charles M. Anderson, 36 Whitfield Rd.
Buckler & Fenhagen, 325 N. Charles St.
Wm. W. Emmart, Munsey Bldg.
Clyde N. & Nelson Friz, Lexington Bldg.
Lucien E. D. Gaudreau, 527 N. Charles St.
David Harrison Inc., 421 St. Paul Pl.
Henry Powell Hopkins, 10 E. Mulberry St.
Palmer & Lamdin, 513 N. Charles St.
Henry G. Perring Co., 10 W. Chase St.
Smith & May, Baltimore Trust Bldg.
Taylor & Fisher, 1012 N. Calvert St.
Wrenn, Lewis & Jencks, 113 W. Mulberry St.
Wyatt & Nolting, Keyser Bldg.

Hagerstown
A. J. Klinkhart, Kohler Bldg.

Salisbury
Edwin Wilson Booth, Box 888
Malone & Williams

Snow Hill
Harris Corddrey

Takoma Park
Ronald Senseman, 504 Flower Ave.

Massachusetts

Boston
Allen, Collens & Willis, 75 Newbury St.
Andrews, Jones, Biscoe & Whitmore, 50 Congress St.
Harrison H. Atwood, 61 Alban St.
J. Williams Beal, Sons, 185 Devonshire St.
Frances D. Bulman, 1078 Boylston St.
Coolidge & Carlson, 89 State St.
Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg.
Frank Irving Cooper Corp., 47 Winter St.
Cram & Ferguson, 248 Boylston St.
Desmond & Lord, 1 Beacon St.
Ralph Harrington Doane, 60 Batterymarch St.
M. A. Dyer Co., 1 Beacon St.
Harper & West, 131 State St.
John P. Heffernan, 131 State St.
Henry & Richmond, 12 West St.
Hutchins & French, 11 Beacon St.
Kendall Taylor & Co., 221 Columbus Ave.
Kilham, Hopkins & Greeley, 126 Newbury St.
Edmund I. Leeds, 5 Park Sq.
McLaughlin & Burr, 88 Tremont St.
Maginnis & Walsh, 20 Providence St.
Perry, Shaw & Hepburn, 141 Milk St.
Benjamin Proctor, Jr., 173 Milk St.
Putnam & Cox, 114 State St.
Louis Warren Ross, 9 Park St.
George H. Sidebottom, 120 Milk St.
Oscar A. Thayer, 171 Newbury St.

Fall River
Israel T. Almy, 56 N. Main St.
Edward M. Corbett, 49 Purchase St.
Henry Fallows, 131 Stewart St.

Fitchburg
S. W. Haynes & Associates, 336 Main St. (also in Hartford, Conn.)

Florence
Frank M. Mahoney, 45 Beacon St.

Haverhill
Morse, Dickinson & Goodwin, 25 Washington Sq.

Lawrence
Office of James E. Allen, 351 Essex St.
Ashton & Huntress, 477 Essex St.

Leominster
Harold E. Mason, 15 Prospect St.

Lowell
Perley F. Gilbert, 53 Central St.
Harry Prescott Graves, 40 Middlesex St.

New Bedford
Brown & Poole, 4 Chapman Bldg.
William Tallman, 222 Union St.

North Adams
Arthur F. Eldridge

Pittsfield
Harding & Seaver, 126 Fenn St.

Springfield
D. R. Baribault, 166 Buckingham St.
Gardner & King, 33 Lyman St.
Morris W. Maloney, 49 Washington Rd.

Wellesley
William H. Brainerd, 10 Upland Rd.

Westfield
Malcolm B. Harding, 6 Main St.

Worcester
Lucius W. Briggs Co., 314 Main St.
Edwin T. Chapin, 311 Main St.
Frost, Chamberlain & Edwards, Slater Bldg.
Harry L. Meacham Associates, 120 Front St.
O. E. Nault & Sons, 48 Hamilton St.

Michigan

Ann Arbor
Fry & Kasurin, First National Bank Bldg.

Battle Creek
A. B. Chanel, 9 Merwood Dr.
Lewis J. Sarvis, Bailey Bldg.

Bay City
Joseph C. Goddeyne, Bay City Bank Bldg.

Birmingham
J. Rob't. F. Swanson, 309 Wabeek Bldg.

Clawson
Max A. Musch, 118 S. Bywood St.

Dearborn
Bennett & Straight, Schaefer Bldg.

Detroit
Derrick & Gamber, Inc., Union Guardian Bldg.
J. Ivan Dise, 2631 Woodward Ave.
Donaldson & Meier, 1601 Washington Blvd. Bldg.
Frank Eurich, Jr., Detroit Bank Bldg.
Aloys Frank Herman & Howard T. Simons, Owen Bldg.
C. R. Jensen, 3757 Gladstone Ave.
Albert Kahn, Inc., New Center Bldg.
Lane-Davenport-Meyer, Donovan Bldg.
Lyndon & Smith, Murphy Bldg.
McGrath & Dohmen, 3648 Mt. Elliott Ave.
Malcolmson, Calder & Hammond, Inc., 1217 Griswold St.
George D. Mason & Co., 409 Griswold St.
G. M. Merritt & Lyle S. Cole, 1111 Collingwood Ave.
George L. W. Schulz, Board of Education, 1354 Broadway
Smith, Hinchman & Grylls, Inc., Marquette Bldg.
N. Chester Sorensen Co., Industrial Bank Bldg.
Alex. Linn Trout, Penobscot Bldg.
B. C. Wetzel & Co., Dime Bank Bldg.

Grand Rapids
Roger Allen, Grand Rapids National Bank
Knecht, McCarty & Thebaud, Watson Bldg.
Henry H. Turner, Powers Bldg.

Iron Mountain
F. E. Parmelee, 346 Stockbridge Ave.

Ironwood
N. Albert Nelson, 164 Harding Ave.

Jackson
Clare Allen & Sons, Dwight Bldg.
Frost & Snyder, 407 S. Jackson St.

Kalamazoo
LeRoy & Newlander, Pratt Bldg.
Stewart-Kingscott Co., 208 Elm St.

Lansing
Lee Black & Kenneth C. Black, Capitol Savings & Loan Bldg.
Warren S. Holmes Co., Olds Tower Bldg.

Menominee
Derrick Hubert, Sheridan Rd.

Mullett Lake
G. Harold Thompson

Plymouth
George J. Haas, 243 N. Main St.

Port Huron
Walter H. Wyeth, Peoples Bank Bldg.

Royal Oak
Frederick D. Madison Inc., 258 Washington Sq. Bldg.
Worden & Price, 269 Washington Sq. Bldg.

Saginaw
Samuel C. Allen, Eddy Bldg.
Frederick Beckbissinger, 304 Carroll St.
Donald A. Kimball, Eddy Bldg.
C. E. Macomber

St. Johns
R. V. Gay
St. Clair Pardee, 703 S. Oakland St.

Traverse City
Ralph L. Bauer, State Bank Bldg.

Minnesota

Albert Lea
LeRoy Gaarder

Duluth
E. F. Broomhall, Box 472
Erickson & Co., Alworth Bldg.
Giliuson & Ellingsen, Torrey Bldg.
H. Reinhold Melander, Phoenix Bldg.
P. M. Olsen, Sellwood Bldg.
Thomas J. Shefchik, Glencoe Bldg.
C. H. Smith, Torrey Bldg.
Sullivan & Orrfelt, Lyceum Bldg.

Fergus Falls
Foss & Co.

Hibbing
J. C. Taylor

Mankato
Pass & Rockey, 124½ E. Jackson St.
Ernest H. Schmidt, Coughlan Bldg.

Minneapolis
Croft & Boerner, 1004 Marquette Ave.
Haxby & Bissell, 1111 Nicollet Ave.
Jacobson & Jacobson, Sexton Bldg.
Lang & Raugland, Wesley Temple Bldg.
Larson & McLaren, Roanoke Bldg.
Charles F. Leighton, Roanoke Bldg.
Pesek & Shifflet, 914 Marquette Ave.
Sund & Dunham, Essex Bldg.

Moorhead
Carter & Meinecke, First National Bank Bldg.

New Ulm
Albert G. Plagens, 300 N. State St.

St. Cloud
Nairne W. Fisher, 513½ St. Germain St.
Louis C. Pinault

St. Paul
William L. Alban, Endicott Bldg.
P. C. Bettenburg, Inc., 1437 Marshall Ave.
Carl H. Beutow, 306 N. Snelling Ave.
Dean Holm—Eugene D. Corwin, Guardian Bldg.
Ray R. Gauger & Co., New York Bldg.
William M. Ingemann, Globe Bldg.
Clarence H. Johnston, Empire Bank Bldg.
Eugene V. Schaefer, Shubert Bldg.
Slifer & Cone, Endicott Bldg.
Sullivan & Lund, Liberty Bank Bldg.
Toltz, King & Day, Inc., Pioneer Bldg.

Thief River Falls
Henry C. Eckland & Co.

Winona
Boyum, Schubert & Sorensen

Mississippi

Biloxi
John T. Collins, Box 453

Gulfport
Shaw & Woleben, Durham Bldg.
Vinson B. Smith, Jr., Hewes Bldg.

Hattiesburg
Landry & Matthes, Conn Bldg.

Jackson
James T. Canizaro, Lampton Bldg.
Hull & Drummond, Merchants Bank Bldg.
E. L. Malvaney, Millsaps Bldg.
R. W. Naef, 411½ E. Capitol St.
N. W. Overstreet & A. H. Town
James M. Spain, Deposit Guaranty Bldg.

Meridian
Krouse & Brasfield, Kidder Bldg.

Picayune
Wilfred S. Lockyer, 308 1st St.

Starkville
Stevens & Johnston

Missouri

Chillicothe
R. Warren Roberts

Jefferson City
John M. Schaper, Central Trust Bldg.

Joplin
B. R. Van Pelt, 625 Empire St.

Kansas City
Samuel W. Bihr, Jr., 912 Baltimore St.
Ernest O. Brostrom, 3725 Valentine Rd.
Carroll & Dean, R. A. Long Bldg.
Felt & Kriehn, 4638 Mill Creek Pkwy.
Edward M. Fuller, 1012 Baltimore Ave.
Hardy & Schumacher, 410 Scarritt Arcade
Frederick C. Gunn, National Fidelity Life Bldg.
Edgar P. Madorie, 2611 Gillham Rd.
H. D. Pampel, Finance Bldg.
Sayler & Owen, Law Bldg.
Chas. A. Smith, 1009 Baltimore Ave.
Wight & Wight, First National Bank Bldg.

Moberly
Ludwig Abt

St. Joseph
Walter Boschen, 517½ Francis St.
Eckel & Aldrich, Corby Bldg.
Eugene R. Meier, Bartlett Bldg.

St. Louis
Bonsack & Pearce, Inc., 411 Olive St.
Marcel Boulicault, Ambassador Bldg.
Ernest T. Friton, Security Bldg.
Hugo K. Graf, 2825 Olive St.
Henry P. Hess, 411 N. 7th St.
Wm. B. Ittner, Inc., 911 Locust St.
Jamieson & Spearl, Arcade Bldg.
Johnson & Maack, 705 Olive St.
La Beaume & Klein & Macon A. Abbitt, 315 N. 7th St.
Leech & Schmidt, International Bldg.
F. A. Ludewig Co., 3634 Wyoming St.
R. U. McCann, 1031 Big Bend Blvd.
O'Meara, Hills & G. E. Quick Associate, 5709 Waterman Blvd.
G. W. Sanger, Commissioner of School Buildings, 911 Locust St.
O. W. Stiegemeyer, 4412 Lindell Blvd.
Study & Farrar, Arcade Bldg.
Arthur J. Widmer & Associates, Inc., Arcade Bldg.

Springfield
Earl Hawkins, McDaniel Bldg.
Heckenlively & Mark, Landers Bldg.
Dan R. Sandford, Wilhoit Bldg.

Montana

Billings
Chandler C. Cohagen, Hedden Bldg.
J. G. Link & Co., Electric Bldg.
Edwin G. Osness, 2714 10th Ave., N.
William H. Reid, Jr., 1140 N. 30th St.

Bozeman
Fred F. Willson, Box 497

Butte
Walter Arnold, 1232 W. Granite St.

Great Falls
Cottier & Herrington, First National Bank Bldg.

A. V. McIver, Strain Bldg.
George H. Shanley, First National Bank Bldg.
J. van Teylingen, Medical Arts Bldg.

Havre
Frank F. Bossuot, 133 4th Ave.

Helena
Hugenin & De Kay, 440 N. Benton Ave.

Kalispell
Fred A. Brinkman, Whipps Block

Missoula
H. E. Kirkemo, Lehsou Block

Nebraska

Fremont
George Grabe, 304 E. 6th St.

Grand Island
Gordon Shattuck, Clinic Bldg.

Hastings
K. H. Gedney Co.

Kearney
J. P. Helleberg, Central Ave.
McClure & Walker, 2111½ Central Ave.

Lincoln
Fritz Craig, Stuart Bldg.
Davis & Wilson, 525 S. 13th St.
Meginnis & Schaumberg, Federal Securities Bldg.
J. F. Reynolds, 1637 S. 11th St.

Norfolk
James C. Stitt, Norfolk National Bank

North Platte
C. C. Coursey, Neville Bldg.

Omaha
N. R. Brigham, 5404 Western Ave.
Lahr & Stangel, W. O. W. Bldg.
John Latenser & Sons, Inc., Saunders-Kennedy Bldg.
John & Alan McDonald, Standard Oil Bldg.

Scottsbluff
O. J. Hehnke, 213 E. 16th St.

Nevada

Ely
F. W. Millard & Son, 614 High St.

Reno
F. J. DeLongchamps, Gazette Bldg.

New Hampshire

Concord
Harold Holmes Owen, Inc., 3 N. State St.

Dover
J. Edward Richardson, 56 Grove St.

Durham
E. T. Huddleston, University of New Hampshire

Hanover
Jens Fredrick Larson, 27 E. Wheelock St.
Wells, Hudson & Granger, Musgrove Bldg.

Laconia
Norman P. Randlett, 614 Main St.

Manchester
C. R. Whitcher, Beacon Bldg.

Peterborough
Natt Simonds

New Jersey

Camden
Byron H. Edwards, 708 Federal St.
Joseph Norman Hettel, 720 Federal St.
F. Herbert Radey, 101 N. 7th St.

Cliffside Park
Lucht & Anderson, 432 Palisade Ave.

Elizabeth
Leslie M. Dennis, 333 N. Broad St.
Robert C. Edwards & Son, 6 Hillside Rd.
C. Godfrey Poggi, 275 Morris Ave.
Lauren V. Pohlman, 80 Broad St.

Englewood
Lawrence C. Licht, 101 W. Palisade Ave.

Fort Lee
Hacker & Hacker, Main St.

Hackensack
George Nordham, City National Bank Bldg.

Hillside
Jacob Wind, Jr.

Irvington
Victor H. Strombach, 1243 Springfield Ave.

Jersey City
Hugh A. Kelly, 921 Bergen Ave.
John T. Rowland, 30 Journal Sq.

Morristown
Walter Slifer, 10 Park Pl.
Campbell Voorhees, Schuyler Pl.

Newark
Charles F. Ackerman, 45 Clinton St.
J. Frederick Cook, 9 Clinton St.
Guilbert & Betelle, 24 Branford Pl.
William A. Pieper, 45 Clinton St.

New Brunswick
Alexander Merchant & Son, 1 Elm Row
Newton W. Richards, 46 Bayard St.

Ocean City
Frederick F. Mills, 1242 Central Ave.

Passaic
John P. Kelly, 157 Prospect St.

Paterson
Fanning & Shaw, 49 Ward St.
Lee & Hewitt, 152 Market St.
John C. Van Vlandren, 7 Smith St.
Wentworth & Vreeland, 140 Market St.

Perth Amboy
John Noble Pierson & Son, 313 State St.

Plainfield
Ernest T. Brown, 201 E. 5th St.

Red Bank
Vincent J. Eck, Broad St.

Teaneck
John H. Liebau, 191 Larch Ave.
B. Francis McGuire, 705 Linden Ave.

Toms River
P. P. Elkinton, 204 Main St.

Trenton
P. L. Fowler Co., 224 E. Hanover St.
Louis S. Kaplan, 33 W. State St.
Herman L. Mack, 2428 Liberty St.
Wm. W. Slack & Son, 1401 W. State St.

Union
Frederick A. Elsasser, 1000 Stuyvesant Ave.

West New York
William Mayer, Jr., 711 Bergenline Ave.
Frank J. Ricker, 685 Hudson Ave.

Woodbridge
Vincent J. Miller, 12 Crampton Ave.

New Mexico

Albuquerque
Brittelle & Ginner, K. of P. Bldg.
Louis G. Hesselden, 403 N. 12th St.

Carlsbad
W. L. McAtee & Co., Box 889

Clovis
Robert E. Merrell, Box 852

Las Vegas
Chas. W. Barrett

Roswell
C. R. Carr & Co., 204½ N. Main St.

Santa Fe
John Gaw Meem, Box 628
Gordon F. Street, El Torreon Bldg.

Silver City
E. M. Kolben

Tularosa
B. G. Robinson

New York

Albany
Andrew L. Delehanty, 123 N. Pearl St.
H. O. Fullerton, 152 Washington Ave.
James A. Galvin, 11 N. Pearl St.
Gander, Gander & Gander
Thomas L. Gleason, 522 Warren St.
Galen H. Nichols, 93 State St.
Office of Walter P. R. Pember, 24 James St.
J. Russell White, 109 State St.

Amsterdam
Howard F. Daly, 15 E. Main St.

Auburn
Wallace P. Beardsley, Seward Block

Binghamton
Conrad & Cummings, 99 Collier St.
L. J. Kaley, O'Neil Bldg.
A. T. Lacey & Son, 52 Exchange St.
Walter H. Whitlock, 609 Chenango St., P. O. Box 1104

Brooklyn
Francis J. Berlenbach & Sons, 191 Joralemon St.
Walter C. Martin, Supt. of School Bldgs., New York City, Flatbush Ave. Extension & Concord St.
Henry V. Murphy, 1 Hanson Pl.

Buffalo
Frederick C. Backus, 360 Delaware Ave.
Bley & Lyman, 505 Delaware Ave.
Green & James, 1 Niagara Square
Harbach & Kideney, 505 Franklin St.
Albert H. Hopkins, Liberty Bank Bldg.
F. J. & W. A. Kidd, 524 Franklin St.
Daniel G. McNeil, 333 North Dr.
Charles E. Mott, 360 Delaware Ave.
Chester Oakley, 117 W. Tupper St.
Roswell E. Pfohl, 204 W. Huron St.
Carl Schmill & Son, Prudential Bldg.

Cedarhurst
Lawrence J. Lincoln, 118 Cedarhurst Ave.

Centerport
James Van Alst

Cortland
Carl W. Clark, State Theatre Bldg.

Elmira
Robert T. Bickford, 215 W. Water St.

Glens Falls
M. L. Crandell, 200 Glen St.

Gloversville
W. Brown Van Dreser, 31 W. Fulton St.

Harrison
Robert P. Vignola, 231 Harrison Ave.

Hempstead
Edward Hahn, 62 Washington St.

Herkimer
R. E. Sluyter, 203 N. Washington St.

Ithaca
Arthur N. Gibb, 302 E. State St.
John N. Tilton, Jr., Cornell University

Jamestown
Beck & Tinkham, Bailey Bldg.
Raymond A. Freeburg, 1105 W. 3rd St.
Oliver R. Johnson, Fenton Bldg.

Kingston
Gerard W. Betz, 286 Wall St.

Middletown
Robert R. Graham, 25 Prospect St.
E. P. Valkenburgh, 7 Linden Ave.

Newburgh
Gordon S. Marvel, 56 2nd St.

New York

Adams & Prentice, 15 W. 38th St.
Badgeley & Wood, 101 Park Ave.
Wesley Sherwood Bessell, 16 E. 52nd St.
Bloch & Hesse, 18 E. 41st St.
William J. Boegel, 13 E. 37th St.
George A. Boehm, 2 W. 45th St.
Clarence Wilson Brazer, 111 E. 40th St. (also in Chester, Pa.)
Walter B. Chambers, 369 Lexington Ave.
Elliott L. Chisling, 420 Madison Ave.
Coffin & Coffin, 125 E. 46th St.
Corbett & MacMurray, 130 W. 42nd St.
Crow, Lewis & Wick, 200 5th Ave.
Delano & Aldrich, 126 E. 38th St.
Division of Architecture, 80 Centre St.
F. Ferdinand Durang, 270 Broadway
Eggers & Higgins, 542 5th Ave.
Aymar Embury II, 150 E. 61st St.
Randolph Evans, 140 Nassau St.
Evans, Moore & Woodridge, 101 Park Ave.
Wm. Gehron, 101 Park Ave.
Archibald F. Gilbert, 358 5th Ave.
Cass Gilbert, Inc., 41 E. 42nd St.
Alfred Morton Githens, 101 Park Ave.
Goodwillie & Moran, 366 W. 126th St.
William S. Gregory, 171 Madison Ave.
W. K. Harrison & J. A. Fouilhoux, 30 Rockefeller Plaza
Edward Shepard Hewitt, 32 E. 67th St.
Thomas H. Irving, 15 Park Row
Louis F. Jallade, 597 5th Ave.
Office of Adolph H. Knappe, 192 Lexington Ave.
Archibald G. Lamont, 156 5th Ave.
William Lescaze, 211 E. 48th St.
Office of Henry J. McGill, 415 Lexington Ave.
W. Philip McGovern, 156 E. 42nd St.
McKim, Mead & White, 101 Park Ave.
Frederick Mathesius, 101 Park Ave.
Mayers, Murray & Phillip, 2 W. 47th St.
E. P. Mellon & W. L. Smith, 350 Madison Ave.
Daniel D. Merrill, 11 E. 44th St.
Charles B. Meyers, 31 Union Sq., W.
Morris & O'Connor, 101 Park Ave.
Robert J. Reiley, 62 W. 45th St.
James Gamble Rogers, Inc., 156 E. 46th St.
Rossiter & Muller, 22 E. 40th St.
Shreve, Lamb & Harmon, 11 E. 44th St.
Smith & Ward, 100 E. 42nd St.
Starrett & Van Vleck, 267 5th Ave.
Stearns & Stanton, 160 5th Ave.
Stoughton & Stoughton, 156 E. 42nd St.
Tooker & Marsh, 101 Park Ave.
Office of Hobart Upjohn, Grand Central Terminal
William Van Alen & Harold Werner, 141 E. 52nd St.
T. Visscher & J. Burley, 51 E. 42nd St.
F. B. & A. Ware, 1170 Broadway
Harold G. Webb, 101 Park Ave.
Edgar I. Williams, 126 E. 38th St.
Wilson & Rahm, 140 E. 39th St.
York & Sawyer, 100 E. 42nd St.

Niagara Falls

Chester R. Phelps, Gluck Bldg.

Ogdensburg

Samuel D. P. Williams, 500 Knox St.

Olean

A. W. E. Schoenberg, 31 Hamilton Ave.

Plattsburg

Alvin W. Inman, 71 Clinton St.

Poughkeepsie

William Henry Jones, 2 Cannon St.
Edward C. Smith, 39 Market St.

Richfield Springs

Myron A. Jordan, Main St.

Riverdale-on-Hudson, New York City

Dwight James Baum, W. 244th St. & Waldo Ave.

Rochester

Carl C. Ade, 52 James St.
C. Storrs Barrows, 56 James St.
Lewis J. Brew, 42 East Ave.
Charles A. Carpenter, Genesee Valley Trust Bldg.
Dryer & Dryer, 2550 East Ave.
William G. Kaelber, 311 Alexander St.
George F. Lorenz, 3086 St. Paul Blvd.
Francis R. Scherer, 13 S. Fitzhugh St.
Smith & Stickney, 154 East Ave.

Rome

F. W. Kirkland, James St.

Schenectady

J. M. Ryder, 122 Jay St.

Southampton

Wm. I. LaFon, Jr.

Syracuse

Melvin L. & Harry A. King, Denison Bldg.
Randall & Vedder, Sedwick, Andrews & Kennedy Bldg.
D. Kenneth Sargent, Starrett-Syracuse Bldg.
Wright & Ellis, City Bank Bldg.

Troy

Frank J. Morgan, 30 2nd St.

Utica

Bagg & Newkirk, 258 Genesee St.
Edward J. Berg, Berg Bldg.

Valley Stream

Frederic P. Wiedersum, 240 Rockaway Ave.

Watertown

Office of D. D. Kieff, C. of C. Bldg.

West Hempstead

W. H. Spaulding, 22 Stevens Ave.

Westport

Quentin F. Haig

Wyandanch

Hugo H. Avolin, Belmont Rd.

Wyoming

Bryant Fleming

Yonkers

H. Lansing Quick, 35 S. Broadway

North Carolina

Asheville

Ronald Greene, Ltd., Arcade Bldg.
Lindsey M. Gudger, 52 Carter St.

Charlotte

Louis H. Asbury, Commercial Bank Bldg.
M. E. Boyer, Jr., 202 Latta Arcade
Chas. W. Connelly, Builders Bldg.
Lucien J. Dale-Warren Mobley, Wilder Bldg.
Chas. C. and Walter W. Hook, Commercial Bank Bldg.
M. R. Marsh, Builders Bldg.
Willard G. Rogers, 103 S. Tryon St.

Durham

Atwood & Weeks, Inc., Southern Fire Bldg.
George Watts Carr, 111 Corcoran St.
R. R. Markley, Southern Fire Bldg.

Gastonia

Hugh E. White

Goldsboro

A. J. Maxwell, Jr., Borden Bldg.

Greensboro

W. L. Brewer, United Cigar Stores Bldg.
C. C. Hartmann

Henderson

Eric G. Flannagan, McCain Bldg.

Hendersonville

Erle G. Stillwell

Hickory

Robt. L. Clemmer, Grant Bldg.
Q. E. Herman, Box 538

High Point

Eccles D. Everhart, 114½ W. Washington St.
Tyson T. Ferree, 110½ W. Washington St.

Kinston

A. Mitchell Wooten, 114½ E. Gordon St.

Leaksville

James W. Hopper, 234 W. Washington St.

Louisburg

M. Stuart Davis

Mars Hill

Henry I. Gaines, 93 Patton Ave.

Monroe

I. J. Tucker, Wadesboro Ave.

Raleigh

Wm. Henley Deitrick, 102 W. Hargett St.
H. P. S. Keller, 129 Hillcrest Rd.
Frank B. Simpson, 120½ Fayetteville St.

Shelby

V. W. Breeze, Lineberger Bldg.

Wilmington

Leslie N. Boney, 221 S. 5th St.

Wilson

Chas. C. Benton & Son
Frank W. Benton, P. O. Drawer 1369
Thomas B. Herman, Nash St.

Winston Salem

Harold Macklin, Reynolds Bldg.
Northup & O'Brien, Reynolds Bldg.
William Roy Wallace, Reynolds Bldg.

North Dakota

Bismarck

Ritterbush Bros., 209 N. 7th St.

Devils Lake

John Marshall, 205 5th St.

Fargo

Braseth & Houkom, Black Bldg.
William F. Kurke, 1117 13th Ave., N.
Joseph E. Rosatti, 117 Broadway

Grand Forks

Joseph Bell DeRemer, 1518 Veits Ave.
Theodore B. Wells

Minot

G. H. Bugenhagen
E. W. Molander, First Avenue Bldg.
Ira L. Rush

Ohio

Akron

M. P. Lauer, 31 N. Summit St.

Bowling Green

S. P. Stewart & Son, 135 W. Wooster St.

Bridgeport

George Ray Connelly, Freter Bldg.

Bucyrus

William Unger, Box 545

Canton

Charles E. Firestone, 1342 Cleveland Ave., N.W.

Cincinnati

Charles Frederick Cellarius, St. Paul Bldg.
Gustave W. Drach, Inc., Union Trust Bldg.
Frederick W. Garber, 616 Walnut St.
Grunkemeyer & Sullivan, 3717 Eastern Ave.
Harry Hake & Harry Hake, Jr., Gilbert Ave.
Hunt & Allan, 914 Main St.
E. C. & G. T. Landberg, 114 Garfield Pl.
John F. Sheblessy, 12th & Republic Sts.
Tietig & Lee, 34 W. 6th St.

Cleveland

Walter G. Caldwell, Engineers Bldg.
Junior W. Everhard, 9219 Clifton Blvd.
Harry A. Fulton, 5716 Euclid Ave.
Hubbell & Benes Co., 4500 Euclid Ave.
Walter R. McCornack, 10006 Carnegie Ave.
Potter & Bremer, Prospect-Fourth Bldg.
James William Thomas, Standard Bldg.

Cleveland Heights
William Koehl, Heights-Rockefeller Bldg.
Nicholas S. Zajack, 3716 Berkeley Rd.

Columbus
John Quincy Adams, 53 Lexington Ave.
E. W. Austin, 17 S. High St.
F. F. Glass, 20 S. 3rd St.
Harsh & Davies, 145 N. High St.
Edward Kromer, Board of Education, 270 E. State St.
Richards, McCarty & Bulford, 584 E. Broad St.
F. S. Rusk & C. W. Youst, 35 E. Main St.
John P. Schooly
Howard Dwight Smith, Ohio State University
Samuel F. Swales, 142 E. Northwood Ave.

Coshocton
Fred D. Jacobs, 514 Main St.

Dayton
Walker, Norwick & Templin, American Bldg.

East Liverpool
H. Allan Todd, 511 College St.

Elyria
Silsbee & Smith, Turner Bldg.

Forest
Burk & Seebach

Fort Laramie
F. E. Freytag

Fremont
C. H. Shively, 400½ Croghan St.

Grand Rapids
W. Howard Manor, E. Main St.

Hamilton
George W. Barkman, 20 N. Sixth St.
Frederick G. Mueller & Walter R. Hair, Hotel Hamilton

Hillsboro
Henry R. Ervin, 114 N. High St.

Lima
Thomas D. McLaughlin & Associates, Dominion Bldg.

Mansfield
Harry J. Brumenshenkel, Walpark Bldg.

Middletown
Harold W. Goetz, Savings & Loan Bldg.

Nelsonville
William Mills & Son, 241 Washington St.

New Philadelphia
Charles J. Marr, 151½ N. Broadway

Norwalk
Granville E. Scott, Citizens Bank Bldg.

Portsmouth
DeVoss & Donaldson, 1st National Bank Bldg.

South Euclid
A. F. Foose, 2031 Temblethurst Dr.

Springfield
Eastman & Harman, Columbia Bldg.

Steubenville
Fred H. Clarke, National Exchange Bank Bldg.

Sugar Grove
Wagstaff & Son

Toledo
Britsch & Munger, Nicholas Bldg.
Edwin M. Gee, Board of Education
Jokel-Coy-Thal, 320 Ontario St.
Langdon & Hohly, Security Bank Bldg.
Mills, Rhines, Bellman & Nordhoff, Inc., 518 Jefferson Ave.

Warren
Roy T. Campbell, Park Ave. & High St.
Keich & O'Brien, Union Bank Bldg.

Youngstown
Myron N. Goodwin & Co., Union National Bank Bldg.
M. Gilbert Miller, 12 W. Madison Ave.
Charles F. Owsley, 211 N. Champion St.
Richard A. Zenk, 144 W. Wood St.

Oklahoma

Ada
Albert S. Ross, Cummings Bldg.

Altus
Aubrey C. Chisum

Ardmore
J. B. White & Sons, 902 B. St., N. W.

Bartlesville
Arthur Gorman, Box 772

Chickasha
Paul Harris, Oklahoma National Bank Bldg.

Enid
George Blumenauer, Stephenson Bldg.
R. W. Shaw, Bass Bldg.

Muskogee
H. H. Niemann, 1155 Summit St.

Norman
Joe E. Smay, University of Oklahoma

Oklahoma City
Dennis E. Donovan, 101 E. 3rd St.
C. F. Drury, Perrine Bldg.
Edw. L. Gahl, Continental Bldg.
Hicks & Moore, Cotton Exchange Bldg.
Layton, Hicks & Forsyth, Braniff Bldg.
J. O. Parr, Hales Bldg.
Sorey, Hill & Sorey, First National Bldg.
Tonini & Bramblet, Cotton Exchange Bldg.
Walter T. Vahlberg, 311 Hightower
Winkler & Reid, Oklahoma Savings Bldg.

Ponca City
G. J. Cannon, Community Bldg.

Shawnee
Hugh W. Brown, Jr., Petroleum Bldg.
A. C. Davis & Sons, 432 N. Broadway

Stillwater
Philip A. Wilber, 315 Knoblock St.

Tulsa
A. M. Atkinson, Thompson Bldg.
Ralph M. Black, Kennedy Bldg.
F. A. Duggan, Castle Bldg.
John Duncan Forsyth, 115 E. 18th St.
Raymond Kerr, Hunt Bldg.
F. V. Kershner, 1119 S. Florence Pl.
Joseph R. Koberling, 569 S. Peoria St.
A. J. Love & Co., Atco Bldg.
Donald B. McCormick, 1238 S. Boston Ave.
Malcolm McCune, 1308 S. Utica St.
John W. Robb, 112 S. Boston St.
Leon B. Senter, Philtower Bldg.
L. I. Shumway, Alexander Bldg.
A. Thomson C. Thorne, 1643 S. Florence Pl.
Wm. H. Wolaver, Tulsa Loan Bldg.

Oregon

Eugene
John Laurin Reynolds, 841 Willamette St.
Graham B. Smith, Register-Guard Bldg.

Klamath Falls
Howard R. Perrin, Underwood Bldg.

Medford
William Laing, U. S. National Bank Bldg.

Portland
Barrett & Logan, 302 N. Broadway
John V. Bennes, Lewis Bldg.
A. E. Doyle & Associates, Pacific Bldg.
C. N. Freeman, Concord Bldg.
Francis B. Jacobberger, McKay Bldg.
Johnson, Wallwork & Dukehart, U. S. Bank Bldg.
Jones and Marsh, Woodlark Bldg.
Knighton & Howell, U. S. National Bank Bldg.
Lawrence, Holford & Allyn, Failing Bldg.
Roald & Schneider, Spalding Bldg.
F. Marion Stokes, Terminal Sales Bldg.
Lee Thomas, Inc., Weatherly Bldg.
Tourtellotte & Phillips, Pearson-Fourth Avenue Bldg.
Whitehouse & Church, Railway Exchange Bldg.

Salem
Lyle P. Bartholemew, U. S. National Bank Bldg.
Frederick H. Eley

Pennsylvania

Allentown
H. F. Everett & Associates, Commonwealth Bldg.
Ruhe & Lange, 12 N. 6th St.

Altoona
Frank Austin Hersh, Commerce Bldg.
Hunter & Caldwell

Bethlehem
Lovelace & Spillman, 103 W. Broad St.

Bradford
Thomas K. Hendryx, 165 Interstate Pkwy.

Carlisle
Bobb & Bixler, 82 E. Ridge St.

Charleroi
J. C. Brenton, First National Bank Bldg.

Chester
Clarence Wilson Brazer, 421 Market St. (also in New York)

Columbia
Granville E. Paules, 554 Chestnut St.

Donora
Conrad C. Compton, 4th St. and Thompson Ave.

Doylestown
A. Oscar Martin & Son, Hart Bldg.

Du Bois
Russell G. Howard, Deposit Bank Bldg.

Ellwood City
B. J. McCandless, 239 4th St.

Erie
Geo. E. Eichenlaub, Commerce Bldg.
Fred A. Fuller, Commerce Bldg.
J. Howard Hicks, 124 W. 7th St.

Esterly
Elmer H. Adams

Greensburg
Robert J. Brocker, 201 Coulter Bldg.
C. H. Sorber, First National Bank Bldg.

Harrisburg
C. D. Hasness, 222 Market St.
Kast & Kelker, 222 Market St.
Clayton Lappley, Riverview Manor, Front & Harris Sts.
Lawrie & Green, 3rd & Forster Sts.
Joseph Lesher Steele, 23 N. 3rd St.

Hazleton
Harry B. Lentz, Traders Bank

Johnstown
Horace A. Bailey, Fisher Bldg.
H. B. Raffensperger, Johnstown Trust Bldg.
H. M. Rogers, Johnstown Bank & Trust Bldg.

Lake Ariel
Floyd A. Chapman

Lancaster
Henry Y. Shaub, 20½ N. Queen St.

Lewisburg
Malcolm A. Clinger, 33 N. 2nd St.

Lykens
E. J. Kosier, Young Bldg.

McKeesport
C. R. Moffitt, Masonic Temple

Monessen
H. Ernest Clark, 725 2nd St.

Moylan
William McKee Walton, Box 163

New Castle
W. G. Eckles Co., Lawrence Savings & Trust Bldg.
The Thayer Co., Greer Bldg.

Norristown
Harry Gordon McMurtrie

Oil City
Emmett E. Bailey, 111 Center St.
Holmes Crosby, Beers Bldg.

Philadelphia
Arthur H. Brockie, Architects Bldg.
Horace W. Castor, Architects Bldg.
Paul P. Cret, Architects Bldg.
Henry D. Dagit & Sons, 1329 Race St.
Davis & Dunlap, 1805 Walnut St.
Folsom & Stanton, Architects Bldg.
Gondos & Gondos, Architects Bldg.
Francis A. Gugert, Architects Bldg.
Frank E. Hahn Inc., 1700 Walnut St.
Heacock & Hokanson-C. A. Scheuringer, 1211 Chestnut St.
Karcher & Smith, 1520 Locust St.
Fiske Kimball, Pennsylvania Museum of Art, Fairmont
Charles Z. Klauder, 1429 Walnut St.
W. H. Lee, 1505 Race St.
MacKenzie & Blew, Otis Bldg.
Emile G. Perrot, 1405 N. 16th St.
Savery, Scheetz & Gilmour, Stephen Girard Bldg.
Howell L. Shay, Packard Bldg.
Thomas & Martin, Architects Bldg.
Horace Trumbauer, Land Title Bldg.

Phoenixville
John H. Mowere, 221 Bridge St.

Pittsburgh
W. M. Braziell, 323 4th Ave.
Carlisle & Sharrer, Martin Bldg.
R. C. and M. C. Celli, Century Bldg.
Press C. Dowler, Century Bldg.
Joseph Hoover, Starr Bldg.
J. Lawrence Hopp, 508 3rd Ave.
Ingham & Boyd, Empire Bldg.
Richard Irvin, Grant St. at 3rd Ave.
Kaiser, Neal & Reid, 324 4th Ave.
Edward B. Lee, Chamber of Commerce Bldg.
Marks & Simboli, 541 Wood St.
William Richard Perry, 2882 W. Liberty Ave.
John H. Phillips, Wabash Bldg.
Prack & Prack, 119 Federal St.
Schwab & Palmgreen, Koppers Bldg.
James T. Steen & Sons, 323 4th Ave.
A. N. Steinmark, Empire Bldg.
Edward Stotz, Bessemer Bldg.
Robert Maurice Trimble, Commonwealth Building Annex
Harry Viehman, Chamber of Commerce Bldg.

Pottsville
Philip G. Knobloch, 1811 W. Market St.

Reading
William H. Dechant & Sons
H. I. Eiler, 147 N. 5th St.
G. C. Freeman, 419 Carsonia Ave.
W. Marshall Hughes, 147 N. 5th St.
Muhlenberg, Yerkes & Muhlenberg, 5th & Walnut Sts.
Calvin J. Young, Pres., Associated Registered Architects, 226 N. 6th St.

Sayre
Harry C. Child, 501 S. Keystone Ave.

Scranton
Lester Merritt Davis, Rehrig Bldg.
Davis & Lewis, Scranton Electric Bldg.
Hancock & Willson, Mears Bldg.
W. Monroe Whitney, Brooks Bldg.

Sharon
Clepper & Clepper, 72 Vine Ave.

State College
Dean E. Kennedy, Glennland Bldg.

Stroudsburg
Rinker & Kiefer, 7th & Main Sts.

Sunbury
Davis & Rice

Telford
Charles M. Talley, 314 W. Broad St.

Uniontown
H. W. Altman, Fayette Title & Trust Bldg.

Washington
S. Lloyd Beall, Washington Trust Bldg.
C. Garey Dickson, Court Square Arcade

Wilkes-Barre
Thos. A. Foster, Brooks Bldg.
R. M. Herr, 140 S. Main St.
Innes & Levy, 176 S. Main St.
Mack & Sahm, 22 N. Franklin St.
Stanley K. Walborn, Second National Bank Bldg.

Williamsport
W. D. Schollenberger, 11 W. 4th St.
R. Douglas Steele, 34 W. 4th St.

York
F. G. Dempwolf, Cassatt Bldg.
John B. Hamme, 31 W. Market St.
Robert A. Stair, 100 E. Market St.

Rhode Island

Pawtucket
Albert H. Humes, 332 Main St.
Monahan & Meikle, 255 Main St.

Providence
Edward O. Ekman, 72 Weybosset St.
Irving S. Gorman, City Hall
Albert Harkness, Industrial Trust Bldg.
Joseph A. Hickey, 45 Oldham St.
Howe & Church, Turks Head Bldg.
Jackson, Robertson & Adams, Turks Head Bldg.
Milton F. MacIntosh, 44 Franklin St.
Harry L. Meacham Associates, 58 Weybosset St.

South Carolina

Anderson
Charles Wm. Fant, 109½ Sharpe St.

Bennettsville
H. D. Harrall, 717 W. Main St.

Charleston
David B. Hyer, Peoples Bldg.
Simons & Lapham, 7 State St.

Clemson
Rudolph E. Lee

Columbia
Lafaye & Lafaye, 1226 Sumter St.
J. B. Urquhart, Central Union Bldg.
Wessinger & Stork

Florence
Hopkins & Baker, Florence Trust Bldg.

Greenville
J. E. Sirrine & Co., 215 S. Main St.

Lancaster
Julian S. Starr, Box 143

Rock Hill
A. D. Gilchrist

South Dakota

Aberdeen
Roland R. Wilcken

Huron
F. C. W. Kuehn, Masonic Temple

Mitchell
Walter J. Dixon, Medical Arts Bldg.
Floyd F. Kings, Western Bldg.

Rapid City
James C. Ewing, 609½ Main St.

Sioux Falls
Hugill & Blatherwick, Boyce Greeley Bldg.
Perkins & McWayne, Paulton Bldg.
Harold Spitznagel, Western Surety Bldg.

Tennessee

Bristol
R. V. Arnold, 602 Shelby St.

Chattanooga
Crutchfield & Law, 929 Chattanooga Bank Bldg.
Selman T. Franklin, 806 Cherry St.
R. H. Hunt Co.
Clarence T. Jones, 210 Glenwood St.
W. H. Sears & P. B. Shepherd, James Bldg.
Gordon L. Smith, Volunteer Bldg.

Johnson City
D. R. Beeson, Sells Bldg.
Leland K. Cardwell

Kingsport
Allen N. Dryden, Improvement Bldg.

Knoxville
Frank O. Barber, 722½ Market St.
Barber & McMurry, 517½ W. Church Ave.
Baumann & Baumann
R. F. Graf & Sons, Journal Bldg.
Manley & Young, Box 1495
Clem H. Meyer, 142 Morningside Drive
M. E. Parmelee, Cherokee Bldg.

Memphis
George Awsumb, 1792 Forrest Ave.
Estes W. Mann, Inc., Shrine Bldg.
Regan & Weller, Commerce-Title Bldg.

Nashville
Asmus & Clark, Nashville Trust Bldg.
C. K. Colley & Son, American National Bank Bldg.
Dougherty & Clemmons, Third National Bank Bldg.
Hart & Russell, Hitchcock Bldg.
Granbery Jackson, Jr., Vendome Bldg.
McKissack & McKissack, Morris Memorial Bldg.
Marr & Holman, Stahlman Bldg.
Donald W. Southgate, Nashville Trust Bldg.
Tisdale & Pinson, Independent Life Bldg.
George D. Waller, Independent Life Bldg.
Office of Emmons H. Woolwine, American Trust Bldg.

Texas

Abilene
David S. Castle Co.

Alpine
Victor J. Smith, Sul Ross College

Amarillo
J. C. Berry, 312 W. 10th St.
Guy A. Carlander, Box 3158
Emmett F. Rittenberry & Son, Fisk Bldg.
J. Roy Smith, Blackburn Bldg.
Towne & Funk, Johnson Bldg.

Austin
Giesecke & Harris, Box 24
H. F. Kuehne, Littlefield Bldg.
C. H. Page, Box 936
Page & Southerland, 121 E. 7th St.
Robert Leon White, University of Texas

Beaumont
A. Babin, Perlstein Bldg.
Wallace B. Livesay, San Jacinto Annex
D. E. Steinman, 230 Orleans St.
N. E. Wiedemann, American National Bank

Bryan
Atkinson & Sanders, Parker Bldg.

Corpus Christi
Brock & Roberts, Jones Bldg.
Hamon & Co., Texas State Bank
Nat W. Hardy, Nixon Bldg.
Westfall, Wade & Colley, Nixon Bldg.

Dallas
Arthur A. Brown, Mercantile Bldg.
Ralph Bryan, Construction Bldg.
Eugene Davis, Liberty Bank Bldg.
DeWitt & Washburn, Praetorian Bldg.
Flint & Broad, Burt Bldg.
Bertram C. Hill, Construction Bldg.
C. H. Leinbach, N. Texas Bldg.
Mark Lemmon, Tower Petroleum Bldg.
Walter C. Sharp, Construction Bldg.
Hoke Smith, Allen Bldg.

El Paso
Guy Lewis Frazer, El Paso National Bank Bldg.
Percy McGhee, First National Bank Bldg.
Gilbert G. Satrang, First National Bank Bldg.

Fort Worth
W. G. Clarkson & Co., First National Bank Bldg.
Hubert Hammond Crane, 3719 Camp Bowie Blvd.
J. B. Davies & Co., 1312 Hemphill St.
Preston M. Geren, 806½ Burnett St.
E. L. Harshbarger, Independent School District
C. M. Love & Co., 314 S. Henderson St.
Elmer G. Withers Architectural Co., Inc., Mid-Continent Bldg.
Clyde H. Woodruff, 1929 Hurley Ave.

Galveston
Ben Milam, Guaranty Bldg.

Goose Creek
L. L. Huie

Greenville
Roy Kilmer, Greenville National Bank

Harlingen
Stanley W. Bliss, Myrick Bldg.

Henderson
J. L. Downing, First National Bank

Houston
Campbell & Keller, 6451 Main St.
Lamar Q. Cato, Junior League Bldg.
J. W. Dehnert & F. W. Vesey, Assoc., 3908 Main St.
Herbert C. Heath, Bankers Mortgage Bldg.
Hedrick & Lindsley, Inc., Sterling Bldg.
Blum E. Hester
Henry F. Jonas & Tabor, Union National Bank Bldg.
Joseph W. Northrop, Jr., 3940 Main St.
Stayton Nunn-Milton McGinty, Scanlan Bldg.
Harry D. Payne, 3908 Main St.
R. G. Schneider, M. & M. Bldg.
John F. Staub, 500 Stuart Ave.
Henry Aam Stubee, 3908 S. Main St.
Maurice J. Sullivan, 4301 Main St.
Swenson, Heidbreder & Bush, 3940 S. Main St.
Wm. Ward Watkins, 5009 Caroline St.
Wirtz & Calhoun, 500 Stuart Ave.

Jasper
W. C. Meador

Laredo
Guy M. Trout, 1801 Houston St.

Livingston
Emory S. White

Longview
N. L. Peters, Glover-Crim Bldg.

Lubbock
M. C. Butler, Box 418
Haynes & Strange, Myrick Bldg.
F. A. Kleinschmidt, Texas Technological College
O. R. Walker, Palace Theatre Bldg.

Marshall
Stanley Brown

Palestine
T. Brook Dougherty, 201½ N. Spring St.
O. L. Hazelwood, Link Bldg.
Theo. S. Maffitt, 510 N. Sycamore St.

Paris
Will H. Lightfoot
Edwin R. Smith, S. Main St.

Rosenburg
Ernest L. Shult

San Angelo
John G. Becker, 203 Western Reserve Bldg.

San Antonio
Adams & Adams, Insurance Bldg.
Atlee B. & Robert M. Ayres, Smith-Young Tower
Leo M. J. Dielmann, 145 North St.
Morris, Noonan & Wilson, Builders Exchange Bldg.
Will N. Noonan, Builders Exchange Bldg.
Henry T. Phelps, Hicks Bldg.
Phelps & Dewees & Simmons, Gunter Bldg.
Harvey P. Smith, National Bank of Commerce Bldg.

Sherman
John Tulloch, M. & P. Bank Bldg.

Sweetwater
Don W. Smith, 701 E. Arkansas St.

Tyler
Gregory & Cates, Gary Bldg.
Shirley Simons, Citizens Bank Bldg.

Waco
Birch D. Easterwood & Son, Liberty Bldg.
T. Brooks Pearson, 115 N. 12th St.
Harry L. Spicer, Amicable Bldg.

Weslaco
R. Newell Waters

Wichita Falls
Voelcker & Dixon, Inc., 913½ Indiana Ave.

Utah

Logan
Karl C. Schaub & Son, Arimo Bldg.

Ogden
Hodgson & McClenahan, Eccles Bldg.
Eber F. Piers, 2726 Harrison Ave.

Provo
Ashworth & Markham, 44 W. 2nd St.
Joseph Nelson, 135 E. Center St.

Salt Lake City
Ashton & Evans, Beneficial Life Bldg.
Cannon & Mullen, Templeton Bldg.
Pope & Burton, Newhouse Bldg.
Scott & Welch, Dooly Bldg.
Young & Hansen

Vermont

Burlington
Frank Lyman Austin, 240 College St.

Rutland
Arthur H. Smith, Gryphon Bldg.

Virginia

Luray
Mims, Speake & Co.

Lynchburg
Pendleton S. Clark, Krise Bldg.
Hinnant & Smith, Peoples Bank Bldg.
S. S. Johnson & R. C. Brannan, Allied Arts Bldg.

Newport News
Williams, Coile & Pipino, Melson Bldg.

Norfolk
Alex. O. Ferebee, 716 Boush St.
C. A. Neff, Western Union Bldg.
Rudolph, Cooke & Van Leeuwen, Arcade Bldg.

Richmond
Baskervill & Son, Central National Bank Bldg.
Carneal, Johnston & Wright, Electric Bldg.
Merrill C. Lee, 110 N. 7th St.
Raymond V. Long, State Board of Education
Edward F. Sinnott, 112 E. Cary St.
J. Binford Walford, 103 E. Cary St.

Roanoke
Eubank & Caldwell, Inc., Boxley Bldg.
Smithey & Boynton, 112 W. Kirk Ave.

University
S. J. Makielski, Barracks Rd.

Washington

Aberdeen
Clarence W. George, Becker Bldg.
Charles A. Haynes, Aberdeen Savings & Loan Bldg.

Bellingham
Leonard W. Bindon, Medical Bldg.
F. Stanley Piper, Herald Bldg.
Wohleb & Stanton, Herald Bldg.

Ellensburg
A. Eugene Fulton, 220 W. 4th St.

Longview
George MacPherson

Olympia
Jos. H. Wohleb, Chambers Bldg.

Pullman
Stanley A. Smith, State College of Washington

Seattle
Bebb & Gould
Grainger & Thomas, Arcade Bldg.
Wm. J. Jones, Medical Arts Bldg.
William Mallis, Lyon Bldg.
Earl W. Morrison, Textile Tower
F. A. Naramore, Central Bldg.
Fred B. Stephen, Smith Tower
James M. Taylor, Jr., Arcade Bldg.
Arch N. Torbitt, Lloyd Bldg.

Spokane
Charles I. Carpenter, Old National Bank Bldg.
G. A. Pehrson, Old National Bank Bldg.
George M. Rasque, Spokane Savings Bank
Rigg & Vantyne, Peyton Bldg.
Whitehouse & Price, Hutton Bldg.

Tacoma
E. J. Bresemann, Perkins Bldg.
Mock & Morrison, Perkins Bldg.
Fred G. Rounds & Sutton, Whitney & Dugan, W. R. Rust Bldg. (also in Pullman)

Vancouver
Donald J. Stewart, 707½ Main St.

Yakima
Linden B. Bissell, Ward Bldg.
Newton C. Gauntt, R. ‡ 6
John W. Maloney, Larson Bldg.

West Virginia

Bluefield
Alex B. Mahood, Box 410

Buckhannon
Carl Reger, Box 27

Charleston
H. S. Kyle & J. N. Arnold, Union Trust Bldg.
Walter F. Martens, Medical Arts Bldg.
Meanor & Handloser, Payne Bldg.
Warne-Tucker-Silling, Masonic Temple
A. F. Wysong & Co., Virginia Land Bank

Clarksburg
Edward J. Wood & Son, Lowndes Bldg.

Fairmont
L. D. Schmidt, Professional Bldg.

Huntington
Archer & Dean, 2748 Guyan Ave. (also in Louisville, Ky.)
Wm. Francis Diehl, 1827 12th Ave.
Frampton & Bowers, 412 11th St.

Morgantown
Elmer F. Jacobs, 218 High St.

Wheeling
Frederick Faris, 1117 Chapline St.
Edward Bates Franzheim, 1425 Chapline St.

Wisconsin

Amery
E. F. Klinger

Appleton
Raymond N. LeVee, 117 E. College Ave.
Smith & Brandt, Zuelke Bldg. (also in Manitowoc)

Boscobel
Joseph G. Durrant

Eau Claire
Albert F. Larson, 211 S. Barstow St.
Howard M. Nelson, S. A. F. Bldg.
Carl Volkman, 122 S. Barstow St.

Fond du Lac
F. J. Stepnoski & Son, 104 S. Main St.

Green Bay
Gordon Feldhausen, 1464 Elm St.
Foeller, Schober & Berners, 310 Pine St.
Geniesse & Connell, 226 N. Washington St.
Oppenhamer & Obel, 110 S. Washington St. (also in Wausau)

La Crosse
Parkinson & Dockendorff, Linker Bldg.

Madison
Balch & Lippert, 16 N. Carroll St.
Law, Law & Potter, 1 S. Pinckney St.
Frank S. Moulton
Arthur Peabody, State Capitol
Frank Riley & Lewis Siberz, 24 E. Mifflin St.
Starck, Sheldon & Schneider, Inc., 8 S. Carroll St.
Edward Tough, Washington Bldg.

Manitowoc
Wm. J. & F. W. Raeuber, Savings Bank Bldg.
Smith & Brandt, Dempsey Bldg. (also in Appleton)

Marinette
Max Hanisch, Stephenson Bldg.

Milwaukee
N. P. Backes, 610 W. Michigan St.
E. Brielmaier & Sons Co., First Wisconsin National Bank Bldg.
Peter Brust, 135 W. Wells St.
Clas & Clas, Inc., 759 N. Milwaukee St.
Ebling & Plunkett, 739 N. Broadway
Eschweiler & Eschweiler, 720 E. Mason St.
Herbst & Kuenzli, 1249 N. Franklin Pl.
Lindl & Schutte, Inc., 709 N. 11th St.
R. A. Messmer & Bro., 231 W. Wisconsin Ave.
Alfred H. Siewert, 2309 N. 36th St.
Henry J. Van Ryn, 152 W. Wisconsin Ave.
Guy E. Wiley, 1111 N. 10th St.

Oshkosh
Auler, Jensen & Brown, E. R. A. Bldg.

Platteville
S. E. Barnes, 40 Hickory St.

Sheboygan
E. A. Stubenrauch, 809 N. 8th St.

Superior
R. C. Buck, Inc., Telegram Bldg.

Two Rivers
Sylvester Schmitt, Bank Bldg.

Wausau
Oppenhamer & Obel, 610½ 3rd St. (also in Green Bay)

Wisconsin Rapids
A. F. Billmeyer & Son, 172 2nd St.
Hougen & Henderson, Room 8, Wood Block

Wyoming

Casper
Goodrich & Krusmark, Zuttermeister Bldg.

Cheyenne
William DuBois
Frederick H. Porter

Sheridan
C. Walter Wiberg, Edelman Bldg.

Alaska

Juneau
N. Lester Troast & Associates, Shattuck Bldg.

Hawaii

Honolulu
C. W. Dickey, Damon Bldg.

Philippine Islands

Manila
Cesar H. Concio, 843 Rizal Ave.

Porto Rico

Santurce
Rafael Carmoega, Box 3007

Canada

Calgary, Alta.
W. A. Branton, Calgary School Board,

Halifax, N. S.
C. A. Fowler & Co., Capitol Bldg.
A. E. Priest, 428 Robie St.

Hyacinthe, P. Q.
G. Rene Richer, 242 Girouard St.

London, Ont.
O. Roy Moore & Co., 489 Richmond St.

Montreal, Que.
Alfred Potvin, 750 St. Gabriel St.
Edward J. Turcotte, Dominion Square Bldg.

Ottawa, Ont.
Richards & Abra, 55 Metcalfe St.

Quebec, Que.
Pierre Levesque, 115 St. John St.

Regina, Sask.
F. H. Portnall
J. H. Puntin, 408 Darke Block

St. Catharines, Ont.
Lionel A. Hesson, 309 St. Paul St.

St. John, N. B.
H. Claire Mott, 13 Germain St.

Sherbrooke, Que.
Louis N. Audet, 32 Wellington St., N.
J. Aime Poulin, 63 Prospect St.

Toronto, Ont.
Marani, Lawson & Morris, 46 Bloor St., W.
Mathers & Haldenby, 96 Bloor St., W.

Vancouver, B. C.
Harold Cullerne, 325 Howe St.
Harry W. Postle, 590 Hamilton St.

Wolfville, N. S.
Leslie R. Fairn, Main St.

SECTION IV
OPERATION AND MAINTENANCE

STIMULATION AND DEMONSTRATION IN SCHOOL-PLANT REHABILITATION

By S. L. SMITH

Director, Southern Office, Julius Rosenwald Fund

SCHOOL plants were greatly neglected during the years 1932 to 1934. In passing thousands of rural schools, for both white and colored, along modern highways in hundreds of counties of the South, one was depressed by the large number of unsightly schoolhouses and grounds which neither inspired civic pride nor provided recreational facilities and health protection for the pupils.

Condition of School Plants in United States

In the summer of 1934 a form letter was sent by the writer to all state superintendents of education in the United States in efforts to determine the approximate percentage of school plants badly in need of repairs and the estimated cost of putting them in satisfactory condition. Answers to this letter indicated that about 30 per cent of the schools were in immediate need of repairs, and that the cost of rehabilitating these buildings with the necessary enlargements was approximately a billion dollars. The per cent in the rural South was higher than the average for the nation.

It was pointed out that the great neglect of the school plants during the early depression years was beginning to be reflected in too rapid deterioration. Added to this serious situation was the fact that many of these plants were erected by bond issues yet unpaid, on which the annual interest averaged around $5 per pupil enrolled in the United States.

This problem was further complicated by increased enrolment in upper grades and high schools (due to unemployment of young people between the ages of 16 and 18), and lean financial budgets, causing a sharp drop in the annual construction of new buildings from around $15 per pupil enrolled prior to the depression years, to less than $3 in 1933-34.

Committee on School-Plant Rehabilitation

Largely because of the Julius Rosenwald Fund's close cooperation with the southern school officials in building 5,000 rural Negro schools, the Trustees of the fund in May, 1934, authorized Edwin R. Embree, President, to appoint a Committee on School Plant Rehabilitation. Its main purpose is to cooperate with state and county school officials in efforts to stimulate immediate improvement and beautification of rural school plants and a program for continuous upkeep.

The Committee is composed of S. L. Smith, Director for the Southern Office of the Fund, Chairman; Ray L. Hamon, Professor of School Administration of Peabody College, Secretary; Leo M. Favrot, General Field Agent of the General Education Board; W. G. Eckles, State Supervisor of Buildings in Mississippi; W. F. Credle, State Supervisor of Buildings in North Carolina; J. B. Calhoun, Director of School Plant Division in Tennessee; and Raymond V. Long, Director of School Buildings in Virginia.

At the first meeting, held in July, 1934, it was decided:

1. To secure as complete information as possible on each of the approximately 5,000 Rosenwald schools built since July 1, 1920.
2. To stimulate a general program of school-plant improvement and beautification in cooperation with southern school officials, using as a guide information obtained from the study of these 5,000 schools.
3. To set up at least three county demonstrations in school-plant rehabilitation over a cycle of three to four years, in efforts to determine the best organization and methods for continuous improvement and upkeep of rural school plants.

The Chairman of the Committee sent blanks through the fifteen southern state departments of edu-

cation to the superintendents of 883 counties in which these 5,000 Rosenwald schools are located. The superintendents filled in and signed a blank for each school showing the condition of the building, grounds and equipment, giving the improvements made the past four years. By the superintendents' own evaluation only 55 per cent of the buildings, 33 per cent of the equipment and 35 per cent of the grounds were reported in good condition. The remaining number were checked as fair or poor. The report showed that 28 per cent had received CWA aid.

Stimulation Program in the South

Using this large mass of information as a guide, it was decided to sponsor, in cooperation with the state departments of education, an intensive program for improvement and beautification of rural schools, offering an elementary library as first prize for the winning school in each state. This contest has continued for three years, and a total of 140 libraries have been given by the Julius Rosenwald Fund to white and Negro schools. Many counties offered additional prizes to stimulate the maximum number of schools to participate, and some states added state prizes to encourage a larger number of counties to take part. The state superintendents offered an attractive Honor Roll Certificate to the school winning first prize in each county. State and county departments of education solicited the cooperation of all agencies in this program—such as farm and home demonstration agents, parent-teacher associations, official and non-official health agencies, garden clubs, highway officials, civic clubs, and public-spirited individuals.

The result of this stimulation program has been very satisfactory as indicated from reports. The *Jackson Daily News*, Jackson, Miss., gives a story of the improvement and beautification contest the first year, which is fairly typical of all southern states (quoted in part):

> "The improvements started with the Negro schools last year when the Rosenwald Fund promoted the contest to stimulate repairs, landscaping and new furniture for these schools. The contest attained its goal so easily that this Fund decided this year to open it to white schools as well.
>
> "Behind the announcement of the winners of the contest of last year, is a story of community resourcefulness and unselfish contribution on the part of white and colored people who are interested in the schools. Broken windows, long neglected, were replaced; new shades and curtains went up at the windows; paint and whitewash were used generally; roofs repaired; swings, seesaws and sports courts appeared over night; sanitary toilets and drinking fountains were installed; lunch rooms built; bookshelves made and stocked; shade trees and shrubs set out, by rural schools and their friends during the year."

This Committe has been in cooperation not only with southern school officials but also with national associations and various Government agencies interested in school-building programs, including the President of the United States. Within the three-year period the Committee issued and distributed more than 250,000 bulletins on "Suggestions for Improvement and Beautification of School Plants," and 50,000 8-page pamphlets on "Suggestions for Landscaping Rural Schools." Large quantities of these were distributed by the United States Office of Education, WPA and NYA directors.

During this three-year period about 900 counties and more than 40,000 schools took active part in the improvement program. The school authorities were able to enlist the cooperation of Government agencies through aid of the CWA, ERA, WPA, and NYA, resulting in the expenditure of around $200,000,000 toward the improvement and beautification of these long-neglected rural school buildings and grounds, and the erection of several thousand small schools. This does not include the large PWA program in the South consisting in the construction of many thousands of larger buildings, estimated to cost more than $100,000,000.

The total cost or value of the entire school-building program in the United States the past three years has been almost a billion dollars. Reports indicate that more than one-third of these projects are in the fifteen southern states. Still there are probably two million pupils in the South housed in dilapidated, insanitary, poorly equipped buildings.

Demonstration Program

In efforts to develop a continuous program for school-plant upkeep, the Committee, in cooperation with state and county departments of education, set up three county school-plant demonstrations in 1934 to run over a period of three years.

The counties selected for this demonstration are as follows: Coahoma County, Miss., in the delta; Montgomery County, Tenn., in the dark-fired tobacco area; and Nash County, N. C., in the Piedmont area. In March, 1937, Greenville County, S. C., was added.

THE COUNTY SCHOOL-PLANT MECHANIC

In each county a full-time trained school-plant mechanic with a wide range of skills was selected. These mechanics can do all kinds of carpentry and painting, including the building of a modern rural school; make and repair school furniture and teaching equipment; repair all kinds of heating systems; dig wells; keep in good condition sanitary privies as well as the plumbing and water systems of indoor toilets; make and install sanitary drinking fountains; build concrete or gravel walks; lay out plans for landscaping the school grounds; build playground equipment; and install indoor and outdoor electrical equipment wher-

ever power lines are available. Their salaries and expenses are paid jointly by the county boards of education and the Julius Rosenwald Fund.

Each county mechanic is provided with a specially built truck equipped with the necessary tools for the ordinary repairs, and has a school mechanic's shop well equipped for all types of service. These central county shops add much to the efficiency of the service and will help to insure a continuation program in school-plant upkeep.

These superintendents feel that the savings from minor repairs of buildings and the rehabilitation and upkeep of school furniture alone amount to more each year than the cost of maintaining the school-plant mechanic. But in addition to these systematic repairs the mechanics direct the erection of many new buildings or additions to existing plants, build new equipment, and perform many other important services which add greatly to the value of the rural plants and to the comforts of the teachers and pupils.

ORGANIZATION FOR SCHOOL-PLANT UPKEEP

In the planning of the demonstrations, the superintendents as directors bring into cooperation various county agencies, including the county health director, the farm and home demonstration agents, parent-teacher associations and garden clubs. The school-plant mechanic cooperates with the principal of each school in perfecting effective organization of pupil and parent committees on improvement and beautification with a view to establishing a program for permanent upkeep. In Greenville County, S. C., the school-plant demonstration is a part of the unique County Council program, sponsored by all county-wide organizations and Furman University, in which several educational foundations, state and Federal agencies are cooperating.

PROJECT METHOD

Each county mechanic keeps a complete record of his services by projects and numbers, which show in detail the amount of labor, including relief labor, gasoline and oil used, and the total cost of each job. This information is helpful to the county superintendent in planning future improvements and making up his annual repair budget. It also shows him the unbelievable savings effected by this type of service compared with the former plan of contracting for these items of repair through various specialists.

GREENVILLE COUNTY, SOUTH CAROLINA

In Greenville County a skilled mechanic has been selected who will work under the direction of the County Department of Education, with the full cooperation of the South Carolina Department of Education and the Greenville County Council for Community Development.

Furman University at Greenville is furnishing for the mechanic a well-equipped shop as headquarters. Upon request from the County Board of Education, the Executive Secretary and Coordinator of the County Council directed a staff survey of all schools for Negroes (buildings and grounds) in Greenville County. Approximately 50 schools were measured and pictures taken. It is hoped that this survey will aid the county in developing a permanent policy with respect to school repairs.

A four-teacher Negro school was selected and completely rehabilitated and landscaped as a demonstration. Because the Negro schools are in greatest need, the Board of Education voted to direct its efforts the first year toward improving all satisfactory existing colored schools and erecting new buildings wherever needed.

As this program has been under way less than six months, it is not possible at present to give a detailed report of the accomplishments.

NASH COUNTY, NORTH CAROLINA

W. F. Credle, Director of the North Carolina School Building Division, gives the following interesting comment on the county demonstration:

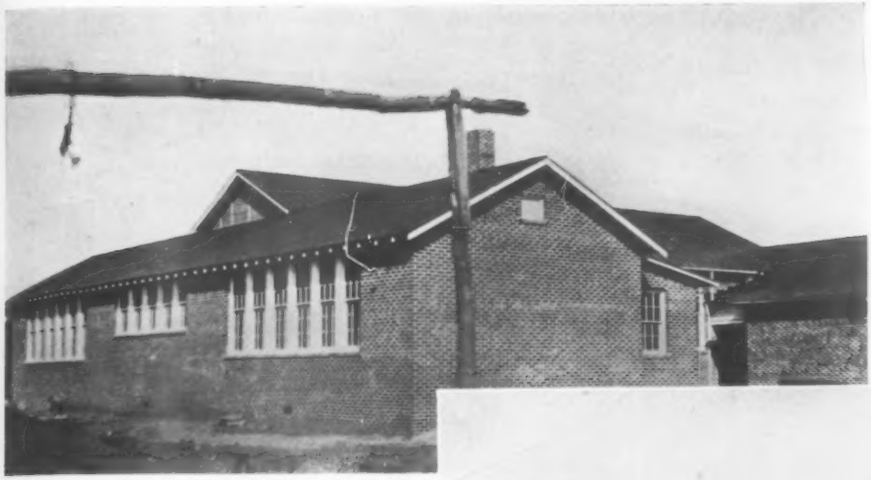
"The demonstration in school-plant maintenance in Nash County has been a signal success. The supervisor in charge is a most versatile man. He is bricklayer, plumber, carpenter, heating engineer, landscape gardener, electrician, painter, and mechanic. In a day's trip to the county, one can find nice evidence of the exercise of his skills. He has put in drinking fountains in numerous schools. He has put concrete walks at others, gravel ones at some, and has assisted in the general repair and beautification program of the county.

"The County Superintendent tells me that the services of this man have meant thousands of dollars to the school plants of Nash County, and that he does not see how he could get along without his services. He states that the mechanic has made repairs at every school in this large rural county.

"Nash County is one of our most populous ones. It has a large number of Negro and white schools. One of the Negro schools in the county was a top-ranking one in the beautification contest.

"During the year Nash County has constructed three new colored schools, three new white schools, added to white schools, and to three colored schools. The school-plant expenditure amounted to $125,000. Three new buildings and two additions were constructed with PWA funds. The total cost of these projects was $116,363. The PWA grant amounted to $52,363. Interestingly enough, this county received no funds from the WPA.

"We are happy in having selected Nash for our demonstration, and I am confident that the success of the project there will have state-wide and South-wide influence, and will mean much toward the stimulation of like work in other counties."



Springhope Negro school before and after it was enlarged and beautified as part of the school-plant rehabilitation program in Nash County, N. C.

A Negro Training School in Nash County, N. C., before and after the enlarging and landscaping program carried on under supervision of the school-plant mechanic

COAHOMA COUNTY, MISSISSIPPI

Because Coahoma County has a large number of Negro schools and only about ten white schools, the Superintendent decided to concentrate for the first year or two on rehabilitating about 40 rural Negro schools which had been built by aid of the Julius Rosenwald Fund, and in constructing a few new buildings to replace schools taught in dilapidated lodge halls and churches. She selected as a mechanic a Negro college-trained in trades, who has had practical experience as a builder and as a teacher of trades. The schools of this county had been neglected for about ten years, the foundations had sagged, the roofs were leaky, the window-frames were rotten, causing the panes to drop out, and the buildings were in a generally dilapidated condition.

Within about two years more than 30 of these schools have been substantially repaired, attractively painted, the equipment renovated, and a large number of the grounds landscaped. In addition to the repairs, a half-dozen new buildings have been erected, ranging from one- to five-teacher types under the direction of this school-plant mechanic, in which he used relief labor, vocational students and community assistance.

Although the program of rehabilitation in this county is far from being completed, the Superintendent states that whoever passes up and down the highways of Coahoma County now comments on the neat, attractive school buildings. Because of the effective demonstration in this county, several other delta counties plan to employ school-plant mechanics.

MONTGOMERY COUNTY, TENNESSEE

Before beginning the work of rehabilitation among the 97 rural schools—62 white and 35 Negro—the Superintendent of Montgomery County and his skilled school-plant mechanic, in cooperation with the University of Tennessee and the State Departments of Health and Education, made a complete survey of all school buildings of the county, taking pictures showing in detail the conditions and needs at each point.

Eight major projects of improvement of buildings and landscaping were set up in the county as demonstrations. The influence of these demonstrations has radiated from these centers to other schools and communities. The program has been so effective that it has not only resulted in the improvement of the physical plant, but has been a means of stimulating greater interest in all phases of education, including curriculum revision, better teaching equipment and community cooperation.

The following summarized report of the main completed projects of this county within a little more than two years is fairly typical of the accomplishments in all these demonstration counties:

65 stove jackets built and installed
86 stoves repaired
99 sanitary fountains constructed and installed
155 sanitary toilets constructed
5 flues rebuilt
56 roofs put on or repaired
38 new doors installed
127 new blackboards installed
58 new locks
235 window-boards constructed and installed
51 windows replaced
17 cisterns dug
7 buildings refloored
639 chairs constructed
97 tables constructed
10 tennis courts constructed
25 basketball courts constructed
10 baseball diamonds constructed
6,000 lineal feet of concrete or gravel walks constructed
2,000 lineal feet of roadway built
400 trees and shrubs set out
81 schoolrooms equipped with lunch shelves
51 schools equipped with playground equipment
50 schools equipped with adjustable shades
55 schools equipped with first-aid kits
92 schools equipped with thermometers
82 floors oiled
35 schools painted
30 cabinets built
650 desks completely renovated
12 major landscaping projects completed
10 new buildings completed
41 shallow-well pumps installed

State Landscape Project

At the request of the State Board of Education in Virginia, the School Plant Committee is cooperating in a state-wide landscape project which has been in operation for less than one year.

The State Department of Education, by approval of the Governor and the State Board of Education, has employed a full-time man to give special attention to improving the physical school plant by way of preparing landscaping plans and specifications, and meeting with local school authorities and other interested patrons in the community.

It is proposed to conduct an active and aggressive program of beautification of school grounds and improvement of school buildings over a three-year period, with the expectation that at the end of this period school plants and grounds will in most cases have been improved and landscaped, and a plan evolved for continuous upkeep and beautification.

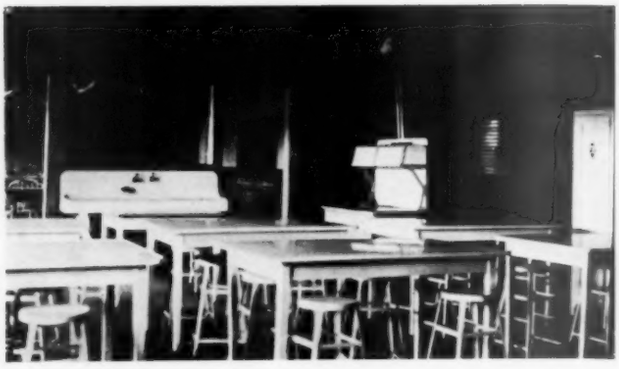
The plan agreed upon for the first year includes the selection of about thirty strategically located counties having high schools with agricultural departments where they will develop nursery stock to be used in the rural schools. It is the plan to have a school-plant mechanic wherever possible attached to each central high school, who will cooperate with the

Pisgah Negro School, Montgomery County, Tenn. Painted and landscaped by the school-plant mechanic, relief and community labor, a very ugly, rough school site has been transformed into a lovely, inspiring setting. Spacious play areas at the side and rear include tennis courts and ball grounds. The interior is just as attractive as the exterior

Above—St. Bethlehem Rural School, Montgomery County, Tenn. This school was built and landscaped by the school-plant mechanic with WPA unskilled labor in about 90 days, the project including steam heating plant, playground equipment, drinking fountain and well with force pump and concrete curbing.

Right—Agricultural High School for Negroes, Coahoma County, Miss., as painted and landscaped by the school mechanic and vocational pupils

Below—Playground equipment at St. Bethlehem Rural School, Montgomery County, Tenn., was built by WPA labor under direction of a school-plant mechanic



Above—Equipment made and installed by school-plant mechanic and vocational pupils for home-making instruction at the Agricultural High School for Negroes, Coahoma County, Miss.

landscape architect, local garden clubs and communities. The high-school agriculture teachers and students will be used in beautifying their own school and in extending this program to all rural schools in the county. The state agricultural colleges are cooperating through their extension departments.

In encouraging and fostering this program, the Division of School Buildings will prepare landscape plans, showing by layouts and by legend the planting of shrubs, laying of sidewalks, etc., along with such specifications as may be necessary to explain clearly how the work is to be done.

A representative of the Department of Education will appear before the community gatherings, school officials and others at the various school sites in an effort to encourage and explain how this work can be advantageously and properly done.

It is proposed that the State Department of Education, through the Division of School Buildings, prepare a quarterly bulletin, to be known as "The Schoolhouse Keeping Quarterly," or some similar name, dealing with problems of school-building maintenance and improvement of grounds, broken down into detailed treatment of the maintenance problems arising in every school plant. Particular emphasis is to be given in this bulletin to the value and importance of the county school mechanic, by using in each issue illustrations from those counties where school mechanics have been advantageously employed.

Courses in Universities and Teachers Colleges

The Committee on School Plant Rehabilitation and state departments of education have been in close touch with state universities and teachers colleges in efforts to have them include courses on improvement and beautification of rural schools. It is felt that the proper training of teachers, supervisors and administrators in this subject will do much to stimulate an effective program of school-plant upkeep.

The favorable reactions and interest of college officials has been most gratifying. In the summer of 1937 several important colleges (both white and colored) had short courses on school-plant improvement and beautification, using in the classes thousands of the two bulletins prepared by the Committee. In some states the Director of the School Building Division gave a series of lectures on this subject to large classes enrolled in state universities and teachers colleges.

This initial program has proved so important that it is being included among regular courses in several colleges. George Peabody College for Teachers of Nashville has included in its catalog Course No. 462, School Plant Beautification and Hygiene, by Dr. Ray Hamon and others. This course deals with the planning, care, use, and improvement of schoolhouses, grounds and equipment. It is designed to meet the needs of teachers, administrators, and health workers, and to prepare teachers for similar courses in teachers colleges.

Conclusion

It is the firm belief of those who have taken part in this program that it has not only stimulated the improvement and beautification of thousands of rural school plants and a plan for continuous upkeep, but that it has had spiritual values in creating among millions of pupils and teachers a greater love for the beautiful that will inspire higher ideals, nobler ambitions and a loftier sense of civic pride, which will result in a happier and more useful, law-abiding citizenship. Theodore Roosevelt once said: "There is nothing more practical than the preservation of beauty; than the preservation of anything that appeals to the higher emotions of Mankind."

PROPER CARE OF THE VARIOUS TYPES OF FLOORS

By JENS FLIKEID

Supervisor of Housekeeping, Board of Education, Minneapolis, Minn.

FLOORS represent such a large portion of the investment in each school building that their care and maintenance deserve more consideration than is usually given them. Such care and maintenance should be planned with the thought of protecting this large investment, improving the general appearance of the building, keeping the building sanitary and clean, and accomplishing this at the lowest possible cost.

It naturally follows that a satisfactory maintenance program should include selection and purchase of the proper types of floor materials and tools with which to do the work, accompanied by a well-planned and faithfully executed procedure. The purchase and continued use of cheap floor cleaners, treatments and tools might easily create the most costly and inefficient type of floor maintenance, and will often necessitate the early replacement of the floors maintained with them. Also, a treatment and maintenance procedure that is not well planned and well executed will often cause unsightly, unclean, and insanitary floors, even though the right materials and tools have been purchased.

Water and scrubbing mixtures of various kinds are detrimental to many kinds of floors, especially wood and linoleum. Scratching, abrasive scouring powders injure most floors and should not be used extensively on any of the hard-surface floors, such as terrazzo, marble, and travertine, except in emergencies. Oil-base soaps should not be used regularly to clean rubber floors, which they are apt to soften, causing rapid deterioration. Spirit cleaners and spirit waxes must not be applied to rubber, asphalt tile, asphalt, mastic, and similar types of floors, for these materials will cause them to disintegrate. Crystalline salts, such as trisodium phosphate, sodium carbonate (soda-ash), sodium metasilicate, although effective wherever and whenever they can be used, must be used with moderation in most cases. Their continued use will result in the building-up of crystalline accumulations within the cracks of the cement, terrazzo, marble, travertine, and similar floors, which will eventually exert such pressure within these cracks that particles of the stone will be broken out.

The foregoing paragraph enumerates a few of the reasons why it is necessary to choose carefully and proceed cautiously in the purchase and application of cleaners and treatments. These items will be elaborated upon in the following discussion.

Care of Wood Floors

Not many years ago, all wood floors were cleaned periodically with various kinds of scrubbing materials and generous quantities of water. Some school systems still adhere to that method of floor maintenance. Scrubbing is one of the most expensive methods of floor maintenance because, to maintain clean and sanitary buildings, the job must be repeated at least once a month. The labor time involved is all out of proportion to the results obtained; the scrubbing mixture becomes a heavy item of expense because the operation must be repeated so often, and the water and alkalies used damage the wood to such an extent that the floors must be replaced sooner than they would otherwise need to be. Wood floors that have been scrubbed never appear to be clean. They are usually gray when the newly cleaned surface is dry, and they become soiled as soon as walked upon.

A later method of floor maintenance included the use of mineral oil, the purpose of which was to settle the dust that was present with the dried-out scrubbed floors. This method was not quite so costly as the scrubbing operation, because mineral oil was cheap, it helped to protect the wood, and the operation did not need to be repeated so often. However, the floors never looked clean. Wood floors treated in this manner were dirt-catchers because of the non-drying quality of the mineral oil, which resulted in black edges and spots on floor surfaces where there was little or no traffic. When this surface dirt and oil were removed by the usual water scrubbing or mopping process in vogue in those days, the whole floor would have an unsightly drab appearance which was not much of an improvement over the black edges and spots. The wood floors were treated at least three times each year with this material in order to obtain the desired result or to serve the purpose for which the material was intended.

The next step in the evolution of wood-floor treatments involved a combination of mineral oils, to hold down the dust, and certain vegetable oils, which were added to treat the wood. This was found to be a progressive step and an improvement over the former type of wood-floor treatment, for the floors so treated had a fine golden color. They were still dirt-catchers in so far as the mineral oil was non-drying, and this resulted in black edges and spots, but these dark surfaces were more easily cleaned because of the harder base created by the vegetable oil. The adop-

tion of an oil cleaner for the removal of the dark surface dirt from this type of treated floor obviated the use of soap and water and left a surface that was much improved in appearance. It was found necessary to clean and re-treat the wood floors with this type of material at least three times a year to keep them presentable.

The knowledge obtained by working with the various types of floor treatments that have been mentioned here, and the results obtained by the use of varnishes on wood floors, led to the discovery and adoption of what is considered to be the best and most economical treatment for wood floors. This is the penetrating floor seal made of vegetable oils, gums, and waxes. In its liquid form, it is very much the same in appearance and texture as floor varnishes, except that it has the property of penetrating into the wood instead of lying on the surface.

This is the most modern treatment for wood floors. The original application with this material is more costly than any of the wood-floor treatments previously mentioned; but, because of its lasting qualities, it has reduced the re-treatment repetitions, and consequently the maintenance cost, to a minimum. In fact, cases have been observed where this floor treatment has lasted six years with only a light touching-up of the worn spots which were the result of the hardest kind of service, and the floor is still in very good condition. Black edges or spots are very seldom found on such floors unless mineral oils have been allowed to accumulate upon them because of lax maintenance methods. These floors can usually be cleaned very easily by the use of an oil cleaner; however, in most cases, it is not necessary to clean them more than once a year unless improper maintenance methods have permitted the building-up of a layer of dirt upon the floor surface.

After six years of intensive experimenting with preparatory application and maintenance procedures, it has been found that the following methods produce the best results in the use of penetrating floor seal.

Preparation for Treatment

If the wood floors have been scrubbed for many years, the surface cellulose matter and fiber are dead. This dead material should be removed to produce a surface of live wood for the penetrating floor seal treatment.

If the wood floors have been treated with mineral oils, this material should be removed, because the penetrating floor seal does not adhere to wood fibers so treated or dry so quickly on this type of surface as it would on clean live wood.

It has been found that sanding is the best method of preparation, since it removes not only the dead wood surface and mineral oil but also any roughness or depressions. It is therefore recommended that wood floors be sanded in preparation for the penetrating floor seal treatment.

After the sanding operation, the floor must be swept thoroughly with a bristle brush, working lengthwise of the boards to remove all the loose dirt and dust from the cracks, after which the fine dust should be picked up with a lightly treated sweeping mop.

Application of Penetrating Floor Seal Treatment

The first step in the application procedure is to dip a cloth into the penetrating floor seal and apply it to the floor around the edges and near stationary furniture. This is done to prevent splashing the mopboard or furniture, which is apt to occur when a mop is used for this operation. The edge treatment should extend from the outer edge to about one foot from the mopboard or equipment.

While walking crosswise of the boards, begin about 6 feet from one end of the room and pour the floor material from the container onto the floor at 6-foot intervals until there are strips of the liquid from side to side of the room spaced about 6 feet apart over the entire floor surface that is being treated. This material should then be spread with a mop and the intervening spaces covered, using a lengthwise stroke to bring the materials in the strips over the bare spaces, then a crosswise stroke to spread it evenly over the high and low places, so that all parts of the floor will receive equal treatment. If the texture of the wood is normal and dry, one gallon of this type of floor material to each 100 square feet of floor surface will be sufficient; however, the floor should be given a generous treatment so that the wood will absorb as much as it can.

Any surplus material remaining on the surface of the floor at the end of thirty minutes should be removed with a squeegee or a dry mop. The complete removal of the surplus material will make the final operation less difficult, for this material will become gummy if allowed to remain.

An interval of at least 72 hours should be allowed to elapse before the final step is undertaken. This consists of buffing the floor with a steel-wool buffing machine until the surface material and the raised portions of the wood have been removed. A light, quick buffing after the floor has been used about one week will leave the surface hard and polished.

The application of a thin coat of spirit wax buffed to a polish will protect this finished surface for a long time. This is not a necessary part of the sealing operation and may be omitted if there is any objection to the hazards of a slightly slippery floor.

Mops or cloths that have been immersed or impregnated with a penetrating floor seal or similar material containing vegetable oils, gums, resins, or waxes

should be burned or placed where they will not be hazardous each night or when the job is completed, for they are subject to spontaneous combustion. They may be immersed in water or in the floor material so that the cloth or mophead is fully covered, if they are to be used again after work has been suspended for a short time.

Periodic Maintenance

The periodic maintenance of this type of treated floor consists of a cleaning operation, using a good oil cleaner, and a light touching-up of the worn parts if necessary.

The cleaning operation should proceed as follows:

First, sweep the floor thoroughly by removing the dirt from the cracks of the floor with a bristle brush, following this with a mop sweeping to remove the fine dust. Such procedure will make the cleaner last longer before it becomes so dirty that it is unfit for use.

Then, immerse the mop in the pail of oil cleaner and proceed to work on the edges and unworn parts of the floor, rubbing briskly and using steel wool under the mop wherever necessary, to remove any tightly adhering surface dirt that may have accumulated. After these sections are clean, proceed to clean the worn parts of the floor, blending these parts with the parts that have already been cleaned, by working over the edges of the sections cleaned first.

Rinse the mop well in the cleaner and go over the entire floor again to remove any dirt that was loosened in the first operation, finishing the job at the door of the room, so that the cleaned floor is not marked by the feet of the worker. Any dullness that may be apparent after the floor is dry can be removed by rubbing the floor surface with a dry mop under which a small pad of steel wool has been placed.

The touching-up operation should be done with the same type of material that was used in the original sealing operation, thinned with a solvent or thinner, such as turpentine or mineral spirits, so that it will penetrate into the wood. This material should be applied only to the spots that actually need it, beginning in the middle of the worn space and working out to the edges. This prevents the material from being applied too heavily along the edges of the worn spots, where the wear is usually much less than in the middle. If the patched sections are noticeable when the material becomes dry, a light steel-wooling will blend them in with the rest of the floor.

Note: New wood floors that are laid on a fresh cement base or close to the ground, or for some reason are not thoroughly dry, will not absorb as much of this type of treatment as will floors that are perfectly dry. Soft woods can be improved greatly by this treatment, but their finished surface cannot be compared with the beauty of maple floors that have been so treated.

Care of Cement Floors

Cement floors compose such a large area in schools, and are such a problem because of the difficulties encountered in their construction, that many experiments have been conducted to find a treatment which will save them from rapid deterioration and sometimes total loss; also to improve their appearance, and accomplish this result in the most economical manner.

Cement floor paints assist in protecting cement floors from deterioration and certainly improve their appearance; however, because they wear off quickly and must generally be applied with a painter's hand brush, they are quite expensive as a maintenance material. On the other hand, cement floor fillers, because they are free from pigments, and leave the floor with its natural color, very seldom show traffic lanes, and therefore the floors upon which they have been applied do not need to be entirely treated when they are partly worn, but can be patched so that the patches will not be noticed by any but the most observant eyes.

Cement floors must be cleaned thoroughly before being treated with cement floor filler. A good scrubbing will accomplish this purpose, using a good oil-base soap scrubbing mixture, providing that there is no excessive amount of oil stains, or other conditions which will require a more drastic cleaning agent. If oil stains are present, cleaning powders such as trisodium phosphate, soda-ash or sodium metasilicate should be used with the scrubbing mixture. Such crystalline cleaners should be preceded by a thorough wetting of the floor with clear water so that the cracks will not be filled with full-strength alkaline solutions.

Regardless of which type of cleaning agent is used, the scrubbing operation should be followed by repeated rinsings with clean water to remove the alkalies, and then plenty of time should be allowed for the floor to dry, since the filler will not adhere to or dry on a floor containing free alkali, caustics or excessive moisture.

When the floor is dry, it must be swept thoroughly to remove any lint that may have remained upon it, after which the cement floor filler should be applied according to the following procedure:

First, apply a thin coat of the cement floor filler to the edges of the floor and adjacent to any stationary furniture or equipment, using a cloth that has been well wrung-out in the material, extending in about one foot from the edges. Apply the cement floor filler to the remainder of the floor in one thin coat with a mop that has been well wrung-out in the material, working both lengthwise and crosswise of each section

or block, so that all parts of the floor will be treated evenly. Any worn parts of the floor, which will be apparent in a very short time as dry spots on an otherwise shiny surface, may be given another thin coat the next day. It is advisable, however, to treat the entire section or block containing the dry spot in order to avoid the appearance of ragged edges where the second coat is needed.

Subsequent treatments should be made in much the same manner, except that it is best not to apply the cement floor filler to the parts of the floors that receive no wear, unless all the old filler is first removed. A complete removal of old cement floor filler can be accomplished by the use of lye, or similar material, diluted in hot water.

In the re-treatment of cement floors, it is recommended that straight lines be drawn either 8, 10 or 12 inches from the walls, wall furniture, lockers and pillars, outside of which no cement floor filler should be applied, except at doorways where either curves or angles may be outlined to separate the worn and unworn parts of the floor. The worn parts of the floor should be within the symmetrical boundary lines.

Continuous re-treatment of unworn parts of a floor builds up a thick, gummy surface at these points, which catches and holds dirt. This results in a spotted, ugly-looking floor, instead of a clean, even-colored one.

Care of Marble and Terrazzo Floors

All marble, terrazzo and travertine floors should be cleaned with a high-grade neutral vegetable oil-base soap that contains no free coloring matter which might stain the light-colored stone or chips. Crystalline salt cleaners should be used infrequently on these floors.

A non-scratching abrasive scouring powder may be used occasionally to remove any lime or hardness which may have been deposited on these floors by the use of hard water in the scrubbing operations, and which often cause them to become discolored in appearance.

Regardless of which cleaner has been used, the floor surface should be rinsed thoroughly after each scrubbing or mopping.

A colorless cement floor filler may be applied to these floors in a very thin coat. This will fill the pores and prevent the penetration of stains that might easily spoil the appearance. Similar results may be obtained by the use of two or three coats of water emulsion wax. The principal objection to wax on hard-surfaced floors is that it may leave the surface slippery and create a hazard. Slipperiness on hard-surfaced floors may be reduced by mixing the water emulsion wax with an equal amount of water for the first two coats and then applying a third coat full strength but as thin as possible. The instructions for applying water emulsion wax contained in the section on "Care of Linoleum and Cork" are applicable to these floors.

Care of Rubber Floors

Rubber tile and rubber carpets are resilient, which increases the gripping quality of this type of floor, making them extremely desirable on ramps and inclines. They are also noiseless, which makes them ideal for service in libraries and other rooms where quietness is essential.

Rubber floors should not be installed in rooms in which grease, mineral oils, hot water, alkalies or spirits are spilled on the floor, for these are harmful to rubber and shorten its life. The exposure of rubber floors to sunshine and extreme weather changes is equally harmful, and their installation in locations where this condition prevails should be avoided so far as possible.

Strong alkalies or soaps and abrasives should not be used in cleaning rubber floors; only a mild mixture of cleaning powder or a high-grade neutral soap should be used. The scrubbing operation should not be repeated any oftener than is absolutely necessary. A light mopping with lukewarm soft water, and the daily maintenance, should serve to keep these floors clean and in good condition between the occasional scrubbings.

If a glossier surface is desired, a thin coat of water emulsion wax may be used on the rubber-tile floor, provided it does not create a hazard. Since rubber carpets are used mainly to prevent slipperiness on inclines, it is inadvisable to use wax on them.

Care of Linoleum and Cork Floors

Linoleum, cork tile and cork carpet floors are manufactured of ground, compressed cork, or strips of cork combined with oxidized linseed oil made into a plastic mass which is rolled into sheets of varying thicknesses and widths on a backing of jute burlap and then baked for from one to six weeks. Since linseed oil can be dissolved by solvent spirits, or be made brittle by highly alkaline or caustic materials, it is recommended that only a mild, neutral soap be used on floors made with this material.

These floors should not be flooded with water during the scrubbing and mopping operations, for the soap and water seeps into the cracks, joints and edges, and after finding its way under the linoleum, cork carpet, or cork tile, slowly softens and disintegrates the material. Then, in addition to shortening the life of the material, a disagreeable odor is created. This is mainly due to the rancidity of the oils contained in the soap and floor material.

This type of flooring can be kept in good condition and made to last a long time by the systematic use of a water emulsion wax treatment, if it is applied before the floor material has lost the surface finish provided

in its manufacture. The bright-drying water wax is preferable, since it reduces the labor cost of the original application as well as all subsequent applications.

To prepare the floor for the wax treatment, it should first be cleaned thoroughly to remove greases and other substances to which the wax will not adhere, and then rinsed well to remove the loosened dirt and the cleaning mixture. The non-polishing or bright-drying wax should then be applied to the floor surface with a lintless cloth or mop placed in a mop holder or with a lamb's wool applicator. The application should preferably consist of three thin coats, all applied without rubbing, with about a 30-minute interval between the coats. This wax treatment will bring out the beauty of the colors in the linoleum floors and protect the finished surface against wear.

The semi-weekly or weekly attention to these floors should consist of a light mopping with a mop wrung out in lukewarm water to which a small amount of water emulsion wax has been added, and followed by a rubbing with a dry mop. This will remove the surface dirt that cannot be removed in the daily maintenance operation with a sweeping mop, and will renew the gloss.

The sections of floor receiving the heaviest wear should be re-waxed periodically, or as often as necessary, to keep the surface of the linoleum or cork from becoming exposed. This will protect the floor surface from becoming worn. Re-treatment of the entire floor surface without first removing all the old wax will build up a gummy substance on the unworn parts which will catch and hold the dirt. Also, re-waxing the entire floor each time a spot becomes worn is uneconomical.

If the floors are old, or the original surface glaze has been worn off, it may be necessary to apply a thin coat of linoleum lacquer or varnish to the surface before applying the water wax. Before any attempt is made to apply either lacquer or varnish, however, all wax, dirt, or grease must be thoroughly removed from the floor surface, or the lacquer or varnish will not adhere to the floor.

Felt-base, or other imitations of linoleum and cork floors, can usually be given the same treatment as the original materials.

Asphalt Tile and Troweled Asphalt Floors

Any floor materials made wholly or partly of asphalt should preferably not be laid in kitchens, garages, or other rooms located directly above a boiler room; nor should they be used elsewhere where high temperatures are maintained.

These floors are economical to install, and they withstand moisture better than most other floors. However, they are quickly disintegrated by grease, mineral oils, and oil solvents, and become brittle from exposure to extreme heat and alkalies. Neutral soap should be used for cleaning them, and water emulsion wax for treating them, following the methods of procedure used on linoleum, cork tile, and cork carpets.

Floor seals or fillers should not be used on asphalt tile floors, for they are usually installed in patterns calling for combinations of colors, and since oils cause them to dissolve, the colors may run from one tile to the next, resulting in a botchy-looking job which will be difficult to repair.

Troweled asphalt, on the other hand, is generally made of one color throughout, so if the surface becomes rough or slightly porous, or if a protection is needed to prevent it from absorbing stains, a specially prepared surface seal, applied thinly and with care, will not prove harmful and will form a better base for later water emulsion wax treatments.

Miscellaneous Floors

In addition to the composition floors already mentioned, there are many other types in use, most of them combinations of asphalt, asbestos, magnesite, wood flour, old rubber, etc.

The kind of treatment they should receive depends upon which of the materials predominates. If the principal material has been determined or is known, then the treatment to be used on the floor must be one which will be harmless to the predominating constituent. However, when the main component part of the floor is unknown, and the manufacturer or his agent has not specified the type of material to use in its treatment or maintenance, then the individual responsible for its upkeep should experiment upon a sample of the floor material, or on an out-of-the-way section of the floor, before attempting to treat the entire floor with some material that may prove ruinous.

It has many times proved advantageous to make such private experiments even though an expert or a salesman has recommended a certain material for use on the floor. Some of the special composition floors look so much alike that it is easy to make a mistake in identifying the base or predominant ingredient they contain. Or, again, sometimes the materials with which one of them has been combined are of such a quality that they have neutralized or made a chemical change in the outstanding ingredient.

Daily Floor Maintenance

The daily maintenance of the floors which have been discussed in previous paragraphs should consist mainly of a thorough sweeping, except in kitchens and rooms where much liquid is spilled, where a daily wet mopping is often necessary.

The use of proper tools for sweeping is most important in the endurance and appearance of the floors and

the finishes which have been applied to them. It has been proved beyond doubt that the sweeping mop, if treated properly for the type of surface on which it is to be used, and used correctly and regularly, will keep floors and finishes in the best possible condition for a longer period of time than any other method. When the dirt is too heavy to be removed with a sweeping mop, it may be swept with a bristle brush, but this should be followed by a mop sweeping.

The following important point should be emphasized here: The amount of mop treatment to be sprayed on the sweeping mop is determined by the treatment the floor has received. Floor surfaces that have been treated with seals, oils, spirit waxes, and the like, will not be harmed if the sweeping mop is given a fairly generous treatment of dust-settling oil, sprayed on it far enough in advance of its use upon the floors to leave the sweeping mop fluffy and prepared to pick up the finest dust. However, the mop should never be treated so that the oil streaks the floor. Untreated floors and floors finished with water emulsion waxes should be swept with mops that have very little, if any, mop treatment on them, or the floor surface may become injured or discolored.

Treated mops pick up fine dust that ordinary bristle brushes cannot remove. This fine dust would otherwise act as an abrasive under the feet of the occupants of the room and, if allowed to remain, would wear out both the finish and the floor before their time. Therefore, a sweeping mop, correctly treated and used, should be part of the daily maintenance of even the best of floors and finishes.

FOR REFERENCE IN THE FIELD OF OPERATION AND MAINTENANCE

Helpful recommendations have been made in articles in previous editions of The American School and University: *

IN THE 1933-1934 EDITION

University and College Accounting and Reporting
By Lloyd Morey, Comptroller and Professor of Accountancy, University of Illinois

The Organization of a Department for the Maintenance and Operation of Public School Buildings
By George F. Womrath, Assistant Superintendent of Schools, in Charge of Business Affairs, Minneapolis, Minn.

Uniform Regulations for School Janitors
By T. C. Holy, Bureau of Educational Research, Ohio State University

School Warehouse Revolving Funds

Fire Insurance Protection and Costs for Public School Properties
By H. C. Roberts, Chairman, Committee on Insurance, National Association of Public School Business Officials

IN THE 1935 EDITION

Taking the School Inventory and Accounting for School Supplies in Small Schools
By F. E. Henzlik, University of Nebraska

Economy in Use of Janitor Supplies and Equipment
By H. H. Linn, Business Manager, Public Schools, Muskegon, Mich.

The Use of Color in the Remodeling and Renovating of School Buildings
By T. Merrill Prentice, Adams & Prentice, Architects, New York

The Modern Trend in School Construction
By Reginald E. Marsh, Tooker & Marsh, Architects, New York

Self-Inspection of Buildings for Fire Protection
By T. Alfred Fleming, Supervisor, Conservation Department, National Board of Fire Underwriters

IN THE 1936 EDITION

Effective and Efficient Operation and Maintenance of a School System
By Nate W. Downes, Chief Engineer and Superintendent of Buildings, School District of Kansas City, Mo.

Raising the Standards of School Sanitation
By George L. W. Schulz, Assistant Director, Department of Buildings and Grounds, Board of Education, Detroit, Mich.

The Summer Renovation Program
By J. L. Gleason, Clerk of School District No. 4, Livingston, Mont.

Maintenance and Operation of a University Plant
By Frederic B. Johnson, Yale University

What Price Neglect of the Heating Plant?
By Alfred Kellogg, Consulting Engineer, Boston, Mass.

IN THE 1937 EDITION

The Distribution of Public School Supplies
By R. W. Hibbert, Director, Books—Supplies—Equipment, Board of Education, St. Louis, Mo.

Fire Insurance Engineering Service
By Carl Reger and A. K. Brake, Consulting Architect and Insurance Engineer, respectively, of the West Virginia Fire Insurance Service Bureau, Buckhannon, W. Va.

The Efficient Operation of a Central Heating System
By Burdette R. Sheldon, Chief Engineer, Mount Holyoke College

See also, the Classified Index in the rear of this volume for information concerning manufacturers of equipment or supplies. This list is necessarily abbreviated. However, additional information on any product—whether listed in the Classified Index or not—may be obtained by using the reply postcards bound in that section.

* Copies available at $2.50 each.

BUILDING MAINTENANCE AND THE SCHOOL JANITOR

By N. E. VILES

Member of the Summer Faculty of the University of Missouri;
Director of School Building Service, Missouri State Department of Education

and

W. W. CARPENTER

Professor of Education, University of Missouri

AN increased interest during the last few years on the part of school officials in school-building maintenance has brought forth a realization that any study of building care and maintenance must include some consideration of the personnel of the janitorial or custodial force. It is difficult to estimate the importance of the work of the janitor in promoting the efficiency of a school system. Adequate janitorial and maintenance service may prevent a too rapid deterioration of school property and excessive losses from the $5,400,000,000 invested in public elementary and high school buildings and sites in the United States.[1] Perhaps even more important than the conservation of property values is the work done by the janitor in maintaining healthful, sanitary, and comfortable conditions in the school building. It is difficult to measure the effect of adequate janitorial service on the lives and habits of the school children or on the results obtained from the money and effort expended on the educational program.

Factors That Make for Poor Janitorial Service

During the past too little attention has been given to methods of administering the janitorial maintenance program. The difficulty in securing well-trained janitors, poor methods used in selecting new men, the lack of tenure, and inadequate salary schedules, indicate a need for careful study and planning in this field. In too many cases janitors have been selected on the basis of friendship and sympathy, or to repay some obligation, with little thought of the effect such selections may have on the progress and efficiency of the school system. As a result of these practices, the money provided for building maintenance has in many cases been used to provide a soft job with a "pension," at the expense of the district, for men unable to hold positions in other occupations.

Tenure regulations for teachers and the non-teaching staff have not in all cases applied to the custodial force. Many men after serving a school several years are still compelled each year to compete for positions with untrained men on a price basis. A study of the tenure of janitors in a selected group of school districts in Missouri shows that fifty per cent of these janitors have held their present positions less than five years. This lack of tenure has done little to promote efficiency or to induce the janitors to make a study of their jobs.

Low salaries and the lack of an adequate retirement system for janitors prevent many competent workmen from selecting building-maintenance work as a vocation. Hamon states that it will be impossible to secure janitors of the type desired until the pay and dignity of this important work are placed on a basis that will attract and hold people able to meet the mental and physical requirements that should be established for this service.[2] Certainly, the salaries paid have not generally been equal to those paid other skilled workmen; in fact, they have been too low to assist in attracting skilled workers to this field. The American Institute of Public Opinion[3] states that a decent standard of living for the average family of a skilled laborer should be $1,820 per year. Table No. 1, adapted from a research study by the National Education Association,[4] shows that few janitors receive a salary permitting them to live up to the "decency standard." A study of the salaries paid in a selected group of school districts in Missouri, each with a population of less than 100,000 and with no retirement provisions, shows that the average janitor in these districts receives about $825 per year, and that a few

TRENDS IN SALARIES PAID JANITORS IN CITIES OF DIFFERENT SIZES[4]

	1930-1931	1932-1933	1934-1935	1936-1937	Per Cent of Change 1931-37	Per Cent of Change 1935-37
Over 100,000 *....	$1,541	$1,265	$1,211	$1,297	−15.83	+ 7.10
30,000 to 100,000 *	1,444	1,287	1,233	1,298	−10.11	+ 5.27
10,000 to 30,000 **	1,360	1,267	1,192	1,231	− 9.49	+ 3.27
5,000 to 10,000 **..	1,275	1,14	969	1,068	−16.24	+10.22
2,000 to 5,000 **..	1,190	1,045	946	1,023	−14.03	+ 8.14

* Does not include head janitor.
** Does not include superintendent of buildings and grounds.

Table 1

1 United States Department of Interior, Office of Education: "Statistics of State School Systems, 1933-34," p. 71.

2 Hamon, R. L.: "How Can We Achieve Satisfactory School Sanitation?" —*School Executives Magazine* (December, 1932), Vol. 52, p. 150.

3 Gallup, George, Director, American Institute of Public Opinion: Press release, July 11, 1937.

4 Adapted from "Salaries of School Employees, 1936-37," National Education Association Research Bulletin, No. 2 (March, 1937), Vol. XV, pp. 62-66.

of them receive less than $400 per year. An adequate salary during the period of service, and compulsory retirement at fixed age levels, with a retirement income salary, is now considered essential.[5]

Janitorial Qualifications

It is difficult to set up definite regulations covering the qualifications of all janitors. Womrath states that the janitor should be an economist in the use of supplies, a sanitarian, a sociologist, a diplomat, a moralist, an expert housekeeper, an engineer, and an expert mechanical engineer.[6] The ideal set up by Womrath may seem impossible of attainment, but to some extent the janitor must meet all the qualifications listed.

Age and Physical Condition.—Although setting an age limit may bar some men who are physically able and fully competent to do the janitorial work, it seems desirable to require the janitor to be at least twenty-one years of age before he is placed in charge of a building. He may then be permitted to continue in this work until he reaches the retirement age for that particular system or state, when these are determined. However, no janitor should be employed or retained in a system if he is not physically fit and free from contagious disease or physical defects that would handicap him in his work or that might endanger the people with whom he comes in contact.

Habits and Character.—The janitor should be free from obnoxious habits and should not be addicted to the use of liquor or narcotics. His character and reputation should be of the best. In fact, he should be the type of person with whom the parents are willing to have their children associate.

Reeder states that, ". . . the janitor has an important moral, educational, and public-relations influence in the school and in the community. He usually associates with the pupils, particularly the boys, more than any other school employee. . . . They go to him for advice on various problems. Unless the janitor is intelligent and is clean in body and mind, his influence upon the pupils is not likely to be what it should be." [7] In general, the actions of the janitor should be subject to the same regulations as are those of the teachers. The school janitor as a representative of the school system should be clean morally; he should be dependable and trustworthy.

Neatness of Person and Dress.—The type of janitorial service provided determines to a great extent the type of housekeeping standards set up for the building. The janitor is the school housekeeper. Cleanliness and neatness begin with him. It seems difficult for a man who is not clean in person and in dress, or who does not know what cleanliness means, to maintain an attractive, sanitary school building. Moreover, in spite of long hours, in spite of the dirty and unpleasant tasks that the janitor has to perform, it is essential that he maintain a pleasing appearance before the public. The janitor is often the first person met by visitors entering the school building. His dress and appearance at such times should be in keeping with the dignity of the school.

It is understood that the janitor has a a number of dirty tasks to perform. For this work he may provide a pair of overalls or coveralls which may be removed before he enters the corridors or classrooms. He should not be expected to appear before the pupils, the teachers, or the public without having his hair combed, without having shaved within the last 24-hour period, and without being properly clothed. A majority of the schools have found it desirable to adopt a uniform for the janitors. Some schools use a khaki uniform, but the one generally preferred is made up of gray trousers with a light stripe, a gray shirt, a belt, and a black bow tie. The janitor should not be expected to appear before the school wearing a vest without a coat nor with exposed suspenders. Shoes should be black and should have been recently polished. Women janitors should also be expected to wear uniforms; preferably gray or blue of some heavy cloth. The collar and sleeves may be trimmed in white.

Special Skills and Abilities.—The janitor performs so many tasks that it is not feasible to expect him to be an artisan in each of them. It is necessary, however, that he have some knowledge of all types of building-maintenance problems and that he have developed certain skills and abilities. In the larger school systems certain skilled mechanics may be employed, but in the smaller school systems, where one or two men have charge of all janitorial maintenance and repair work, it is essential that each janitor possess a number of skills.

He should be acquainted with cleaning methods and with the composition of cleansing agents. He should know something of disinfectants and the methods of disinfecting. He must have a knowledge of heating and ventilation and of the principles of fuel combustion. He should know how to repair pumps and to control the various mechanical units used in heating and ventilating systems. It is essential that he have some skill in the repair of plumbing and electrical appliances. If he is able to do these things, the repairs may be made when needed and the district may make a distinct saving in the annual repair bill. While it is not essential that he be a skilled carpenter, he should have some ability in the use of woodworking tools. He should have the ability to do the repair

5 Rice, G. A., Conrad, C. C., and Fleming, Paul: "The Administration of Public High Schools Through Their Personnel." 1933. pp. 579-80.
6 Womrath, G. F.: "Efficient Business Administration of Public Schools." 1932. pp. 279-81.
7 Reeder, W. G.: "A First Course in Education." 1937. p. 500.

work needed on seats, on roofs, and on building hardware. He should be able to replace broken glass and to do hundreds of other odd-jobs around the building. Truly, he needs to be a "Jack of all trades—though master of none."

Janitor Relations

The organization of the janitorial program varies in the different school districts. In some of the smaller districts the janitor is directly responsible to the superintendent of schools. In other districts he is responsible only to the principal of a building. In some of the larger districts he is responsible to the superintendent of buildings and grounds for the general care of the buildings and grounds and for his cooperation with the principal and teachers. His reports on pupil discipline, if any, are made to the principal of the building. Since many building principals are not trained in building maintenance, this joint responsibility seems desirable in many districts. It does not seem at all necessary for the janitor to make any reports to the board of education or to seek authority from the board for direction of his work. It naturally follows that the supervisor in charge of janitorial work should be authorized to recommend new janitors for employment and others for promotion. When a new janitor is employed in a building, he should be informed of the type of organization under which he is to work. Regardless of the type of organization, the janitor should understand that the purpose of all his work in that building is to provide an adequate place for the activities of teachers and pupils. Personal desires or personal opinions that do not promote the activities of the school or its welfare should not be permitted to interfere with the service to be rendered.

Teachers often request janitors to erect shelves, to construct window-boxes, or to provide utensils that may be used in their rooms. Other teachers may request assistance that is outside the realm of work assigned to the janitor. Of course, the janitor should be expected to give every possible assistance to the teacher in her work but, on the other hand, teachers should appreciate that the janitor has a full work schedule and should not expect an undue amount of his time. The diplomatic janitor does not refuse to do tasks requested by the teachers, but often it may be necessary for him to refer them to the principal in case these requests interfere with his regular tasks. It is desirable that the supervisory officer carefully define the duties and functions of the janitor in order that he may use his time to the best advantage. Teachers should be informed of the janitor's work schedule and of the importance of following this schedule. Teachers should know what periods of the day the janitor's services are available and the type of service he is able to render. School is a cooperative enterprise, and the cooperation of all members of the staff is essential.

It is important that the janitor be able to work successfully with children. Even though charged with the responsibility for the protection and preservation of school property and oftentimes with the control of toilet rooms, he is not generally given the authority to punish pupils, and probably should never have this responsibility. No tactful janitor, who is fair but firm in his dealings with pupils, will find it difficult to secure their cooperation either directly or through the teachers in maintaining an attractive building and a yard that is free from rubbish and waste paper. Pupils should be taught that the janitor has certain definite responsibilities for the protection of property and persons, and that it is his duty to report infractions of fixed regulations to the principal. Pupils, too, must learn that school is a cooperative enterprise and that their cooperation is expected.

The janitor will be the first and most intimate contact between the school and some of the pupils. He is looked upon by many as a representative of the school system, and as such it will be his duty to promote good-will for and an understanding of the school system. He is a part of the eyes and ears of the school. With a proper perspective of his position and a little diplomacy, he can make friends for the school system among a group of people not always reached by other school employees. The janitor should appreciate this responsibility, and should not, in an attempt to entertain his friends, consider himself the school "oracle" or the school "newspaper."

Janitorial Responsibilities

General Care of Building and Grounds.—The janitor will be held responsible for the general appearance of the building and grounds and for the operation of the heating and ventilating systems. It is his task to provide the proper temperature in the classrooms for all school activities. In addition to the regular school activities, there may be a number of night non-school meetings held in the building, and while these may not be a part of the janitorial schedule, the janitor feels obligated to look after the building at all times. In many instances he is required to be at the building a number of nights each week. The school superintendent or the one responsible for janitorial service should arrange to relieve the janitor of night responsibility, when it interferes with his regular schedule, by making provision for additional help.

Protection Against Fire.—The janitor in charge of the physical plant will be held responsible for fires arising from causes which he should have eliminated. There are structural defects in many of the school buildings which may create fire hazards. The janitor

should make a written report, outlining these defects, to his superior officer in order that he may have a record on which he may rely in case a loss occurs. The janitor should be held responsible for the fire hazards in the building arising from a lack of proper preventive measures. He should particularly avoid the use of glue-pots, blow-torches, etc., in places where there are combustible materials. The janitor will be charged with the task of filling or having the fire extinguishers filled at regular intervals of not more than one year for soda acid extinguishers. The janitor should prevent the storage of combustible material such as floor oils, kerosene and waste in places where they might be the cause of a fire. He should know that gasoline should not be stored in the building unless in approved cans properly labeled. He should avoid electrical hazards arising from overfusing, or from the hanging of light cords on nails, and from overloaded circuits.

Before leaving, each night, the janitor should make a circuit of the building to look for fire hazards. He should make frequent detailed inspections of the building from basement to attic to look for any hazards that might endanger the building or the lives of the pupils. He should keep all exits unlocked during the time school is in session, all aisles and passageways clear, and all fire-escapes open for egress.

When a fire occurs, the first duty of the janitor is to see that the alarm is sounded. His next task is to see that the fire is extinguished, if it is so small that he can do this. He should have a place in each regular or forced drill, seeing that all doors and exits are open, and should carefully check to see that all pupils are safely out of the building. He should also see that no pupils return to the building until so instructed by the teachers.

Preventing Theft and Loss.—The janitor should not forget that the physical plant of the school is in his charge and that negligence on his part may be responsible for losses of various sorts. He should exercise care to avoid the possibility of loss. Before leaving the building each evening or night, he should check to see if doors are locked and windows latched, as described in his written instructions. It is advisable that he make a circuit of the building each morning to determine any loss during the night. While the janitor is not legally responsible for things stolen from the building, he is morally responsible to help prevent losses of this type. He is provided with a set of keys for the school building, and should not let these out of his possession except at the order of a superior official.

In addition to the protection of the building from theft, the janitor will be held responsible for preventing loss through freezing, breaks, or careless use. He may find it necessary to drain pipe lines or to maintain a fire to prevent freezing in extremely cold weather over the week-ends or during holidays. He should watch for breaks or weaknesses in all parts of the building and report them to his superior officer. He should make an effort to conserve the supplies and equipment in the building. This is particularly applicable to the water, electricity, and gas supply. A complete list of janitorial responsibilities would include a detailed list of his duties and must necessarily be omitted here.

Training for Janitorial Service

School officials are beginning to realize that in order to secure efficient building maintenance service it is necessary to have a corps of trained janitor-engineers. Linn states: [8]

"It is difficult to understand why many American communities spend thousands and hundreds of thousands of dollars in erecting new school buildings and purchasing valuable equipment and then select mediocre men to look after their operation and maintenance. It should be emphasized and reemphasized that economy and efficiency in school administration require a janitorial staff of carefully selected and trained men and women. . . ."

He states also: [9]

"Contrary to general opinion, the janitorial work cannot be learned in a few weeks, and it is not so simple that anyone and everyone can perform the many duties efficiently. The time is past when custodians and their assistants can be selected from the ranks of those who are no longer able to secure other positions. Efficient and economical janitorial service requires capable and reasonably youthful men and women. . . ."

Some school districts now provide an apprenticeship training for all beginning janitors. A few of the larger city school districts have organized training courses for the training of janitor-engineers. In addition, several states have developed state-wide training schools for the janitors working in the public school buildings in the state. This training in some of the states leads to certification for janitors. These are movements in the right direction and should be expanded and continued until the quality of janitorial service is brought to the desired standard.

Regardless of all other qualifications and requirements, the janitor who is well trained, and who is willing to work, diplomatic, and proud of his job seems most likely to succeed. The janitor who has a pride in his work will make an effort to know more about the various problems involved. He will be anxious to have his building render acceptable service.

8 Linn, H. H.: "Practical School Economies." 1934. p. 197.
9 Ibid: pp. 197-198.

WHAT A SCHOOL MAN SHOULD KNOW ABOUT PAINT

By G. G. SWARD*

Scientific Section, National Paint, Varnish and Lacquer Association, Inc.

PAINT is a liquid material that is applied in thin films to surfaces for protection, decoration, identification, insulation and other purposes. This definition of paint includes both opaque and clear varieties. In a narrower sense, the opaque varieties are called paints, and the clear ones are called varnishes and lacquers. Waxes and polishes may also be included in the field of paints.

Paint, then, is a mixture of a powder (the pigment), and a liquid (the vehicle or binder). In water paints, the vehicle is usually an aqueous solution of glue (calcimine), or of casein (casein paint).

Varnish exists in two types. The older type is a solution of a resin (shellac, rosin and the like) in a volatile liquid. This is a spirit varnish, so called because alcohol is the volatile liquid. When applied to a surface, the alcohol evaporates and leaves behind a film of the resin. The second type is a cooked mixture of a resin and a "drying oil," thinned to a brushing consistency. When applied to a surface, the thinner evaporates and the remaining film is converted to a solid, in part by chemical reaction with the oxygen of the air.

The term "enamel" is usually applied to a paint which flows out to a relatively smooth hard film, leaving no brush marks.

A clear nitrocellulose lacquer is a spirit varnish. An opaque nitrocellulose lacquer is an enamel.

Since, in the cities at least, most school buildings are constructed of brick or stone, exterior paints are not as yet so widely used as interior paints. The first part of this paper will therefore be devoted to the most widely used interior paint, namely, flat wall paint. A study of the requirements of interior wall paints found in the Federal Specifications has been selected for the basis of this part of the paper.

For many years this specification was based on chemical requirements. But chemical requirements do not tell much about the serviceability of most paints. They do not tell any more about a paint than a cake recipe tells about cakes made by a good cook, and by a cook not so good.

In the course of time, however, a pretty good specification for a flat wall paint has been developed. The requirements in the specification are mainly physical as distinguished from chemical. The paint maker is permitted to use any pigment, oil or varnish, so long as the paint passes these physical tests. There are, however, requirements that the paint contain at least 40 per cent of non-volatile binder in the vehicle, not over 1 per cent of water, and not over 2 per cent of coarse particles.

It may be that you are required by law to purchase much of your paint on specification. However, it should be pointed out that specifications often represent a compromise. Moreover, many paints purchased under trade brand may surpass by a wide margin the minimum requirements in one or more important respects but may fail in some unimportant respect.

Hiding Power.—One of the most important properties of a paint is its ability to hide the surface on which it is applied. Interior wall paints should have a high degree of hiding, so that films of normal thickness will hide satisfactorily.

To measure the hiding power of a paint, use is made of a black and white checkerboard. The paint is applied to the board until the contrast is obliterated. The amount of paint required is obtained by the difference in the weight of the can and brush before and after painting. The area of the board is known, and a simple calculation gives the hiding power in terms of square feet per gallon.

Gloss.—A flat (or matt) paint has a high degree of diffuse reflectance and a low degree of specular, or mirror-like reflectance. Numerical gradings have not been used to any great extent for flat paints, but with the development of better instruments they will probably soon see greater use. Simple comparison of sample and standard has been considered sufficient.

Fastness to Light.—Fastness to light is purely relative. Almost everything, if given enough time, is changed by light. Paints are no exception. Nevertheless, paints vary in degrees of fastness, and those which are inferior in this respect can be detected by the simple test of exposing their films to bright sun or artificial light. One-half of a panel coated with the paint is exposed to the light. The other half is covered with black paper. Very small changes may be detected in this way.

* An address given before the National Association of Public School Business Officials, October, 1937.

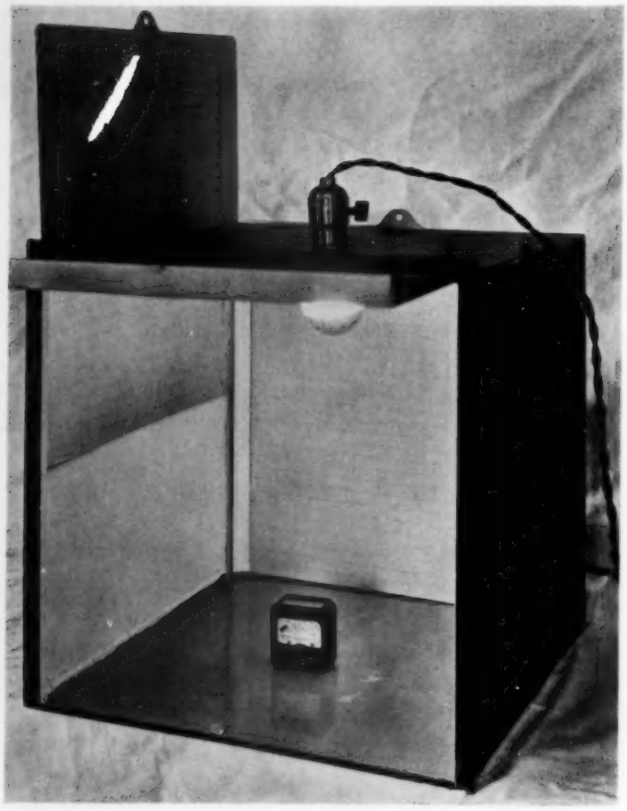


Fig. 1—Effect of the color of walls upon illumination. By means of false walls and ceiling the color of the interior may be quickly changed. Indirect illumination is provided by a shielded 40-watt bulb. A light meter to indicate the amount of illumination under the various conditions is provided

Reflectance.—Another important property of wall paints is diffuse light reflectance. Many have been impressed with the increase of illumination in rooms that light-colored paints give over the darker-colored ones. There are many ways to demonstrate this. At our laboratory we built a miniature room in which the color of the paint may be changed at will. With the red, unpainted brick walls, the room has about 10 foot-candles of light, whereas with white walls it has about 50 foot-candles, an increase of 400 per cent!

White flat paints may have diffuse reflectances as high as 90 per cent. The Federal Specification requires 85 per cent. The values for the light tints are lower. Examples of some are:

Light cream	68	Light blue	50
Light pink	65	Light buff	55
Ivory	65	Light green	55

Wall and ceilings should therefore be decorated in white or in light tints. Too much white paint is objectionable not only because it shows dirt too readily, but also because in interiors it is rather uninteresting. To relieve the monotony of large areas, various types of stipple, tiffany, stenciled borders, and the like should be employed. Mural decorations by art students should also be available.

Spreading Rate.—You may often have been told that this paint or that paint will cover or spread over 300, 400 or even 1,000 or more square feet per gallon. Strictly speaking, the spreading rate depends very largely upon the painter. If he desires, he can spread a normal paint into a very thin layer, but it might be too thin for good hiding, or, in the case of outside paint, too thin for adequate protection. Nevertheless, normal paints possess what may be called a certain spreading rate. The specification that we are studying prescribes a practical method for determining this rate, which consists in applying the paint with a large brush (5½-inch) to ordinary smooth-finish wall board, previously primed with a light-gray white lead primer. Regular painting practice is followed; that is, a section of the surface is coated and lightly cross-brushed, then a second section, and so on. The paint is applied thickly enough to just hide the gray primer. During the application the operator notes the ease of brushing and the extent to which the brush marks flow out as compared with a laboratory paint of known composition, or commercial paints of recognized good properties. Thus, the spreading rate is the area per gallon when the paint is applied just heavily enough to hide a certain gray background.

Drying Time.—This property in flat wall paints is not of vast importance, as most products are suitably controlled and allow a second coat to be applied the next day. Although devices for evaluating this property are available, the good old finger-touch method is ordinarily used. The requirements of the Federal Specification are that the paint sets-to-touch in not less than 30 minutes, nor in more than 4 hours, and dries hard in not less than 18 hours. The setting-to-touch requirements assure that laps will not show. The dry-hard time allows recoating after overnight drying.

Water.—In itself, water is not objectionable. In fact, some desirable properties may be imparted by the addition of a small percentage, say 2 per cent, of

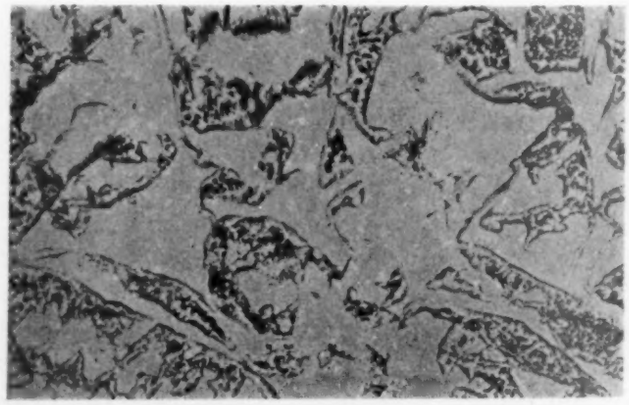


Fig. 2—Mottle tones—A practical and widely used color effect obtainable on wall surfaces

water to some paints. Settling of pigments may be delayed, and brushing properties improved. However, large amounts of water are often accompanied by inferior ingredients. It has seemed the safest procedure to limit the amount in the Federal Specifications to incidental amounts such as that which accompanies pigments and oils in humid weather.

Flexibility.—In order to insure a satisfactory degree of flexibility in the paint, a simple bending test is made. The paint is applied to a tin plate panel and allowed to dry overnight. It is then artificially aged by baking for five hours, and finally bent double over a ½-inch rod. A satisfactory paint does not crack.

Washability.—To some people, this is a very important test. Others believe it is cheaper just to apply another coat of paint. Personally, I believe that washing a painted wall is practical. For one reason, with frequent repainting, the cumulative coat of paint becomes so thick that it finally breaks loose from the wall. The washing test consists in soiling the paint with a blue-black writing ink, a red writing ink, a soft black lead pencil and a grease composed of graphite and petrolatum. Two hours after being soiled, the panel is washed with a cheesecloth and a hand grit soap. Good eggshell-finish oil-base paints may be cleaned in one minute without being worn through. Other things being equal, the higher the gloss of the paint, the more readily it may be cleaned.

Casein paints must be given a milder cleaning than oil base paint, and calcimine may be considered as unwashable.

Other Interior Finishes

For interior wood-trim surfaces, the gloss type of paint is ordinarily used. Varnish or wax finishes may be preferred by some people.

Furniture such as desks are usually protected with varnish, which includes the shellac as well as the nitrocellulose lacquer type.

All wood floors in schools should be coated with floor varnish, floor paints, with so-called penetrating oils, or with wax.

Unless correctly formulated and thoroughly troweled, concrete floors are rapidly abraded by the heavy foot traffic. Floor paints prevent this by binding the loosely held particles and by taking the punishment themselves. New concrete floors should either be left uncoated for several months before painting, or treated with a solution of zinc sulfate to neutralize the alkalinity. Dry floors, that is, floors which are not subject to moisture from the ground, may be successfully painted.

Finally, additional interior places for paint are on radiators, on gas, cold and hot water pipes for identification, and for blackboard renewal.

Exterior Painting

Though the idea of painting the brick, stone and stucco surfaces of school buildings in cities does not often receive consideration, there are many such surfaces that should be painted.

Stucco is very absorptive of moisture. In freezing weather, the absorbed moisture can do a lot of damage. Painting stucco prevents this and also enhances the appearance. Alkali-resistant spar varnish is recommended for priming stucco, but the subsequent coats may be of ordinary house paints.

What applies to stucco, applies to brick, at least so far as mortar joints are concerned. Moreover, some brick itself is highly absorptive. As much as 20 per cent by weight of water may be taken up by common brick. The conversion of the uninteresting color of brick to a pleasant color of course depends upon personal preferences.

Another place where paint is useful is on the walls of shaded courts and light wells. The rooms adjoining such areas are made much more pleasant if the walls of the court are painted white. Figure 3 shows two model offices adjoining courts that are identical in every respect except that one is painted white and the red brick walls of the other are unpainted. The illumination in the former is 30 foot-candles, but in the latter is only 8 foot-candles.

Other exterior surfaces to be painted are those of windows and doors, screens, metal cornices and

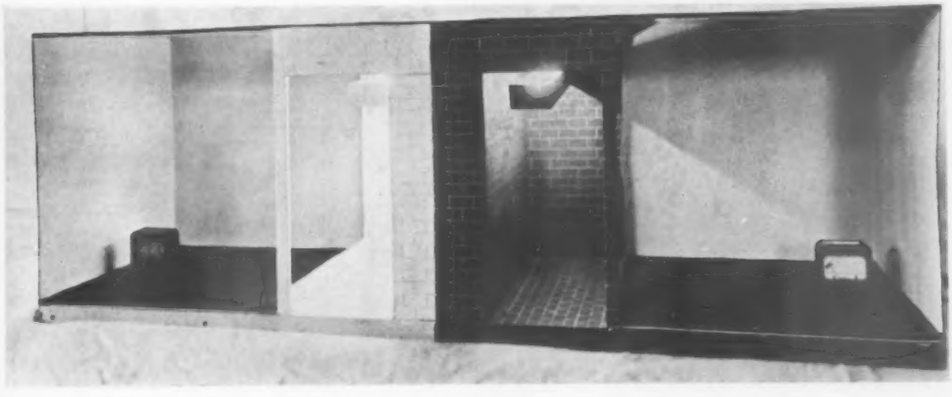


Fig. 3—Effect of the color of light wells upon the illumination of adjoining offices. The office on the right faces an unpainted red brick light well; that on the left faces a light well that has been painted white. Each well is illuminated with an artificial sun, a 40-watt tubular light bulb. The walls of each office are painted a cream color. Light meters show that the office at the left receives about four times as much illumination as the office at the right

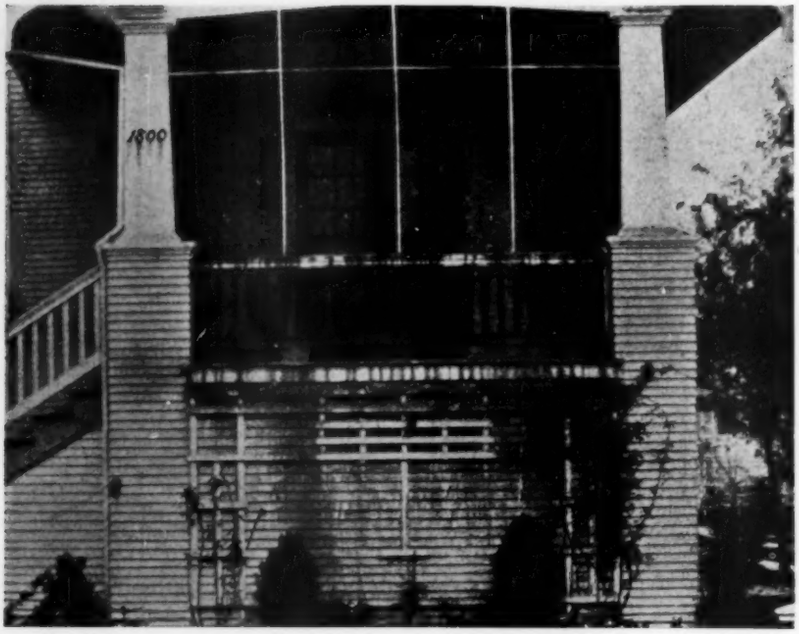


Fig. 4—Copper screens stain white paint—Yellow stain from copper screens running over white paint. Note the heavy deposit on porch railings. All copper screens should be varnished or painted to prevent such defects

copings, fire-escapes, tanks and playground equipment. Unpainted copper screens, gutters and downspouts corrode enough to permit staining of adjoining painted surfaces, even though their strength may not be adversely affected. Figure 4 shows how serious the staining may become.

Wherever such surfaces are iron or steel, rust-inhibitive paint should be used for priming. The best-known rust-inhibitive pigment is red lead, but there are others which may be better for certain purposes. Graphite or aluminum paints should not be used for priming, but may be used for finish coats.

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CEMPRO will set—dust free—in less than 45 minutes. Normally it will dry hard enough in 16 hours to receive a subsequent coat. It will dry hard under any atmospheric conditions in less than 24 hours. Even when applied to a cold, damp surface, the drying process is not materially delayed.

CEMPRO concrete finish is an economy because it prolongs the life of any brick or concrete floor, wall or other surface. The finish will not discolor from gases in the atmosphere nor due to the absence of direct sunlight. It is an ideal coating for use on concrete foundations around heavy equipment.

Give those raw, dusty and worn concrete or brick walls, floors and steps a new and beautiful long-lasting CEMPRO finish. CEMPRO is fully guaranteed to be made of the finest quality materials and to give the utmost satisfaction.

For
FLOORS
WALLS — STEPS

In
AUDITORIUMS
BASEMENTS
CLASSROOMS
CORRIDORS
LAVATORIES
LOCKER ROOMS
STOREROOMS
STUDY ROOMS

and general interior use.

One gallon covers about 250 square feet—according to condition of the concrete. Two or more coats are recommended.

Write for color chart

HYDRO PROOF An asphalt patching or resurfacing material for use on old or worn brick, stone or concrete floors. Booklet on request.

THE HILLYARD SALES COMPANY

BRANCHES IN PRINCIPAL CITIES

St. Joseph Missouri

DISTRIBUTORS FOR HILLYARD CHEMICAL CO.

A National Maintenance Organization . . . Thirty Years Continuous Service

To protect our customers against imitations all Hillyard products are registered and trade-marked and shipped in sealed, checker board designed containers

Super SHINE-ALL is not a soap, Trade-Mark Reg. but a Neutral Liquid Chemical Cleaner for all types of floors, also painted and varnished surfaces. It possesses 100% active cleaning units. SUPER SHINE-ALL cleans, polishes, and preserves in one operation, requiring no rinsing. Saves time and labor. Officially endorsed by leading floor manufacturers. The one cleaning material that is qualified for safe use on every description of floor or wall surface.

HIL-BRITE Self-Polishing Water Trade-Mark Reg. Emulsion Wax, dries bright without rubbing or polishing, with a hard traffic resisting finish, yet has that soft lustrous glow of polished wax. It saves time and labor, cuts your waxing and cleaning costs in half. Endorsed by National floor manufacturers.

The new seven story home of Hillyard Hi-Quality Products

ONEX-SEAL gives positive protection and restores the Trade-Mark Reg. original attractive finish to Terrazzo, Tile and Cement. Tests proved ONEX-SEAL capable of withstanding the most severe weather and traffic conditions. ONEX-SEAL produces a waterproof, weatherproof, dust resistant, sealed polished surface. Nationally recommended by flooring contractors and manufacturers.

TERRAZZINE excels for the premature curing of new Trade-Mark Reg. Terrazzo. Approved by the National Terrazzo and Mosaic Ass'n., and selected by them to treat the Century of Progress display:—"The Cascades of the Months." Economical and simple to apply.

PINE-O-CIDE is an amber colored germicide, antiseptic and disinfectant made from pure Steam Double Distilled White Pine Oil, the highest grade possible to procure. It is soluble and forms a beautiful milk white solution in water. PINE-O-CIDE has a high phenol coefficient and serves efficiently as a fragrant antiseptic, nonirritating and non-corrosive. The fragrant pine odor makes PINE-O-CIDE a very effective deodorant for use in public buildings and institutions.

HIL-GLO FINISH is especially designed to serve on Trade-Mark Reg. Class Room and Gymnasium floors. Universally used for the reclamation and preservation of wood floors in all types of buildings. HIL-GLO FINISH is supreme for wearing quality, is non-skid and does not easily rubber burn.

DIAMOND FINISH produces a brilliant, long wearing Trade-Mark Reg. surface, easy to apply with brush or mop. Quick drying and especially adapted for wood floors.

PENETRATING SEAL NO. 21. The purpose of Penetrating Seal is to SEAL the fibre against penetration of moisture, thus reducing warping, to seal against penetration of dirt, ink stains and moisture, to preserve the natural color of the floor, and provide a more permanent finish that is both beautiful and economical, to reduce maintenance costs.

Penetrating Seal No. 21 fills and seals wood floors, thus eliminating penetration of grease, stains and dirt. All spots and blemishes should be removed prior to application of Penetrating Seal No. 21 either with a strong cleaning compound or by sanding, otherwise they cannot be removed.

HIL-TONE. Hil-Tone removes rubber burns and other marks from wood floors. It not only removes the marks easily when properly used, but also seals and protects the wood itself. The wood retains its light color and does not become oily or greasy as when ordinary dressings are used.

AUTOMATIC SWEEPING BRUSH leaves a clean lustrous surface, absorbs the dust, saves labor. The wicks are detachable and washable.

Sizes 12, 18, 36 inches

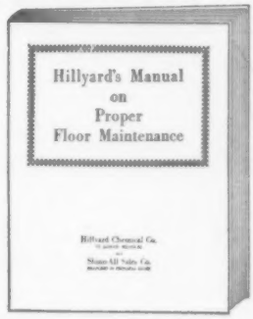
WINDO-CLEAN. This lightning cleaner dissolves grime and removes dirt. No effort. No mess. No hard work. Eliminates buckets, sponges, water, squeegees and chamois, and makes glass sparkle.

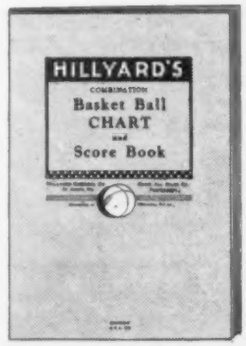
HILLYARD SALES COMPANY

...DISTRIBUTORS HILLYARD CHEMICAL CO. ... ST. JOSEPH, MO. ... BRANCHES IN PRINCIPAL CITIES...

FREE — THREE VALUABLE BOOKS

These three books full of valuable information, just off the press and compiled by the Hillyard Chemical Co. at considerable expense, are for you . . . absolutely FREE. Just another proof that the Hillyard Chemical Co. are the leaders in the field of Sanitation and Modern Floor Maintenance.





SUPER-SPECIAL GYM FINISH produces a non-slippery, durable and sanitary floor, easy to maintain. Withstands hard and constant wear, gives proper reflection of light eliminating eye strain, insures a perfect non-slippery surface which will not rubber burn. Nationally used by leading Schools, Universities and Athletic Clubs, Private and Public Institutions.

HILLYARD'S WOOD PRIMER definitely seals and preserves, insures an ideal surface for the application of any desired finish or treatment. Universally used for the reclamation and preservation of wood floors in all types of buildings.

RENOVATOR. Hopelessly black and gummy floors can be brought out to look like new with Hillyard's Renovator. Oil-soaked wood floors can be scrubbed and bleached to a light color. The extra power in Renovator makes the toughest job easy.

HAND SOAP. Velva-San is shipped in concentrated form, insuring the customer of 100 per cent value in every gallon. Although usually shipped and prepared in its natural state, Velva-San may be had in various colors and perfumes. Velva-San provides individual hygiene used in our dispensers. It is a forward step toward eliminating sickness and disease spread by unsanitary bar soap.

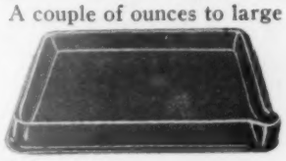
VICTOR SOAP DISPENSER. Built substantially, can always be depended upon to operate perfectly. Made of genuine brass parts, chromium plated. No springs to get out of adjustment, its use insures against waste of soap through dripping. Has universal ball-bearing valve. In case of breakage, any one of the three separate and distinct parts can be replaced at one-third the cost of a new Victor.

HILTONIAN "8" Floor Sanding Machine. With its ease of operation and handling, the Hiltonian "8" stands alone in the field of high production sanders. Although light in weight, nothing is sacrificed in cutting efficiency, as the 1 H. P. Heavy Duty Motor, 8-inch Sanding Drum travels at a surface speed of 3,534 feet per minute.

The Drum is dynamically balanced and with the "Hiltonian" improved spiral wrap of sandpaper, the quality of work cannot be surpassed.

Speed combined with light weight has long been desired by Educational, Public and Private Institutions.

HI-KO. Hi-Ko, a sodium hypochlorite solution, has an extremely high phenol coefficient. A couple of ounces to large quantities of water kills germs. Athlete's Foot — a disease caused by the germ (tinea trichophyton), invades every locker and shower room. Hi-Ko kills this germ. Use it to free infected floors.



Adding 12 ounces of HI-KO to the water in the tray will prevent "Athlete's Foot." The tray should be placed so that each person must walk through the solution when entering or leaving the pool or showers.

NEW "STEEL-TONIAN" STEEL WOOL MACHINE. Many flooring manufacturers recommend dry cleaning. For real economy and satisfaction use Hillyard's Floor Seals with the Hillyard "Steel-tonian";—the perfect steel wool machine.

The frame of the "Steel-tonian" is made of electrically welded steel plate. The only Steel Wool machine that contains a built-in dust collector. It is modern in every respect.

HILTONIAN SCRUBBING AND WAXING MACHINES. Hiltonian Electric Scrubbing and Waxing Machines are sturdily built and quietly operated. It takes but little effort to operate any of these four machines, due to their perfect balance. These machines co-ordinate speed, power and weight to give the utmost in all around service.

A Brush for Every Need. Brushes that are available include Blassine, Tampico, Palmetto, Fibre, Steel Wool and Wire. There are also attachment plates to which sandpaper or burnishing pads can be easily fastened.

Lowboy "Sixteen" 16 Inch

Master Lowboy 21 Inch

HILLYARD—"The Buy-Word for Maintenance Quality Since 1907"

J. I. HOLCOMB MFG. COMPANY

Indianapolis, Indiana

New York San Francisco

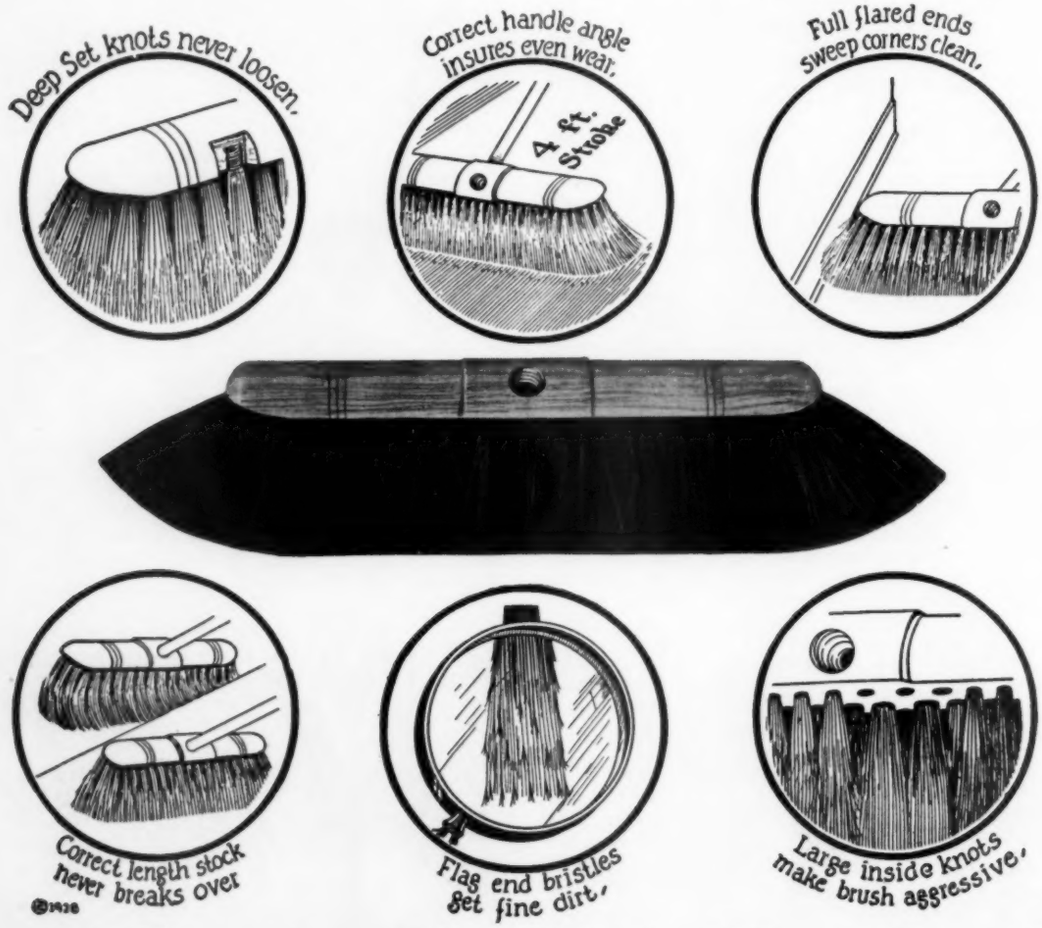
CUTTING SCHOOL CLEANING COSTS

There is a reason why nearly **70 per cent of the schools of the country** are using Holcomb Cleaning Tools and Chemicals. For years the J. I. Holcomb Mfg. Company has been solving the unusual as well as the usual cleaning problems of the nation. Their Floor Brushes, Dusters, Scrubs, Toilet Brushes, Cleansers, Deodorants, Disinfectants, Floor Finishes, Waxes, Polishes, Liquid Soaps and special tools are the standard by which other tools and chemicals are judged. There is an especially designed tool . . . a particular cleaning chemical or brush for every cleaning job in your school . . . built to do the job thoroughly and to cut LABOR Costs by cutting LABOR Time.

CLEANING DOLLARS ARE DIVIDED!

Out of the USUAL Dollar you spend for Cleaning only 5 cents is for the Material!

If you save 10% on the materials you save but little. . . . If you save; with Holcomb tools, 10% of the LABOR COST your yearly profit is materially increased. If you spend $50.00 for materials and $950.00 for labor . . . WHICH will it pay you to save 10% on? **CUT down the LABOR COST with tools built by Holcomb.** If you speed up the job only 1 hour each day, with a Holcomb tool, that is a new yearly PROFIT of about $100.00 to your institution.


Deep Set knots never loosen.
Correct handle angle insures even wear.
4 ft. Strobe
Full flared ends sweep corners clean.
Correct length stock never breaks over
Flag end bristles get fine dirt.
Large inside knots make brush aggressive.

Correct Construction Cuts Cleaning Cost!

Every Minute Counts
When It's Sweeping Time

LET US HELP YOU SOLVE YOUR CLEANING PROBLEMS

THE AMERICAN SCHOOL AND UNIVERSITY

Why Mop Twice?
Holcomb's SPRAY CLEAN Cuts Mopping Time *One-Third!*

and ⅓ of one hour a day amounts to $41.60 in 312 days (labor at 40¢ an hour).

Sprayed solution stays on the floor longer, dissolving more grease and dirt. Your scrubbing job becomes one of merely mopping up! One pint of Spray Clean makes 2½ gallons of solution . . . covering 1500 sq. ft. and leaves the room with the clean fragrance of Sassafras.

In 55-30-15 and 5 gallon drums.

No. 797 Sprayer (illustrated) has a 2½ gallon working capacity. Reduces Refill Time

---

No. 990 Wax Applicator (above)
Applies liquid wax uniformly, making it cover ⅛th more surface. Three felts 12" long, 1½" wide

Holcomb's
"WATER-PROOF" WAX
Eliminates Water Spots!

Holcomb's SELF-POLISHING "WATER-PROOF" Wax contains a new emulsifying agent which evaporates . . . leaving only the tough, lustrous WAX FILM. Where wet, muddy feet track your floors; wherever water spots show USE "WATER-PROOF" WAX. Flows on freely, can be walked on in 20 minutes. Lasts longer and wears under heaviest traffic without polishing or buffing. Cut costs with Holcomb's "WATER-PROOF."

In 55-30-15-5 and 1 gallon cans.

Holcomb's
SEAL COAT

The secret of Seal Coat's success is the fact that it does not build up above the floor surface but penetrates and combines with the wood to form a new 1/32" hard, protective tread. One Seal Coat conditioning this year will keep your old floors like new for years to come . . . you must wear off the wood to wear off Seal Coat. **ONE gallon of concentrated Seal Coat plus one gallon of turpentine give you TWO GALLONS OF SEAL** that will cover from 1000 to 1600 sq. ft. depending on the porous condition of the wood.

SEAL COAT **PENETRATES**

In 55-30-15-5 gallon drums.

MIDLAND CHEMICAL LABORATORIES, Inc.

Dubuque, Iowa, U. S. A.

THE COMPANY

Amply financed and backed by continuous progress for over a third of a century in the production of exclusive materials for preserving, finishing and maintaining all types of floors, and allied products for the promotion of sanitation and cleanliness.

The MIDLAND CHEMICAL LABORATORIES, INC., offer the discriminating buyer its complete line of time-tested and approved products. Various manuals and catalogues may be obtained from any Midland representative or will be supplied direct on request.

EXCLUSIVE PRODUCTS

MASTER FINISH

Use—On wood, concrete, composition, linoleum and practically every other type of modern flooring.

Description—A non-slippery floor finish, containing bakelite, which resists heat, alkali, alcohol, dilute acids, boiling water and hard use. It dries with a beautiful sheen, will not hold rubber-burns.

Coverage—Wood: 600 sq. ft. per gallon, one coat; 350 sq. ft. per gallon, two coats.

MIDLAND LOHSEAL

Use—On wood, composition, linoleum, cork, masonite and concrete.

Description—Effective, practically colorless, pore and fibre seal. Applies with either a lambs wool or felt mop. Excellent as a seal or a base for a wax treatment. It dries within a few hours.

Coverage—Wood: 400 sq. ft. per gallon, two coats.

OVER A THIRD OF A CENTURY OF PROGRESSIVE SERVICE

MIDLAND FLOOR ENAMEL

Use—On wood, concrete, stone, plaster and metal (exterior or interior).

Description—A quick drying enamel with surprising durability, which produces a smooth even finish with a fine gloss. A chart illustrating the attractive range of colors will be furnished on request.

Coverage—Concrete: 400 to 800 sq. ft. per gallon, one coat, depending on type and condition of material.

MIDLAND GERMOLYPTUS

Use—An all-purpose disinfectant.

Description—A non-poisonous disinfectant with a pleasant aromatic odor. Will not attack human tissue, corrode surgical instruments or permanently stain linens.

MIDLAND LACQAIRLUSTR

Use—For cleaning and polishing varnished, lacquered, baked enamel, leather, and duco surfaces.

Description—A liquid furniture polish with a wax base. Cleans and polishes with one operation leaving a hard, brilliant, non-greasy surface that will not finger mark. Easily removes perspiration and other stains. Does not effect colors. Leaves leather soft and pliable.

MIDLAND WAXLOH

Use—On asphaltic base and other types of mastic floors.

Description—A liquid wax containing no solvent that will dissolve, injure or effect the colors of asphalt or mastic floors. It requires buffing which produces a brilliant, hard surface and resists ordinary scrubbing compounds for a satisfactory period. Applied with a lambs wool mop or clean cloth.

Coverage—From 800 to 1500 sq. ft. per gallon for one coat, depending on the type of flooring.

MIDLAND MID-CEDAR DUST LAYER

Use—For mop sweeping any type of floor.

Description—A volatile, non-slippery, non-greasy, non-sticky, cedar oil preparation which is not injurious to floor finishes. To be used with the dry mop method. It polishes, cleans and picks up all dust quickly and efficiently.

MIDLAND BASIC SURGICAL SOAP

Use—For general and dispenser use in washrooms, preparatory rooms, etc.

Description—A heavy-bodied highly concentrated liquid soap (anhydrous soap content 42%). May be substantially diluted without sacrificing efficiency.

MIDLAND LOHBRITE

Use—A non-buff wax for use on any type of floor.

Description—A liquid, water emulsion wax with a hard carnauba wax base, stands excessive wear, does not require polishing and buffing. It is easily applied with a lambs wool mop or soft clean cloth, and dries ready for traffic.

Coverage—From 1500 to 3000 sq. ft. per gallon for one coat, depending on the type of flooring.

MIDLAND FLOORGLOH

Use—On linoleum, wood, tile, marble and terrazzo floors.

Description—A white paste wax. It should be applied thinly with a lambs wool mop. Dries rapidly and buffs with very little effort, and is resistant to scrubbing solutions.

Coverage—From 800 to 1000 sq. ft. per gallon for one coat, depending on the type of flooring.

MIDLAND MID-WAX

Use—A buffing wax for use on wood, composition, tile, marble, terrazzo, linoleum and cork. Not recommended for use on asphalt base or rubber floors.

Description—A semi-liquid wax easy to apply and easy to polish. It can be buffed within thirty minutes after application.

Coverage—From 1000 to 1500 sq. ft. per gallon for one coat, depending on the type of flooring.

WE MANUFACTURE A COMPLETE LINE OF FLOOR FINISHES, WAXES AND CLEANSERS INSECTICIDES DISINFECTANTS LIQUIDS AND JELLY SOAPS.

MIDLAND MID-SEAL

Use—On marble, terrazzo, unglazed tile, slate, concrete and similar flooring materials.

Description—A seal and waterproofer which protects the flooring from daily traffic. Polishes to an attractive luster within 30 minutes after applying. Lime in cement will not affect Mid-Seal as it does paints and enamels.

Coverage—Terrazzo: 800 sq. ft. per gallon, one coat.

MIDLAND FLOORMASTER SANDING MACHINE

This 8 inch surfacing machine is easy to handle and operate. There are no chains, gears or belts to wear out or cause trouble.

The Midland Floormaster Sanding Machine is capable of producing a high quality finish at a rapid rate.

MIDLAND BOILER COMPOUND

Use—To soften, precipitate, and remove lime or magnesium scale forming salts from boiler water and to prevent same from plating upon the tubes and shell.

Description—An efficient liquid compound that is easily introduced to the boiler. The chemical action of this compound softens and removes old scale and reacts on the scale forming minerals contained in the raw feed water, thus preventing the formation of new scale.

MIDLAND INSECTLOH

Use—A general all-around insecticide for exterminating flies, mosquitoes, roaches, moths, bed-bugs, ants and silverfish.

Description—Insectloh is a liquid solution of extract of Pyrethrum in a bland, colorless, stainless, neutral, vehicle. Insectloh is non-poisonous to humans, but very toxic to insects. May be used in any type sprayer. Does not stain or corrode. Underwriters Laboratories pronounce non-fire hazard when kept away from open flame.

MIDLAND SHILOH PORCELAIN CLEANER

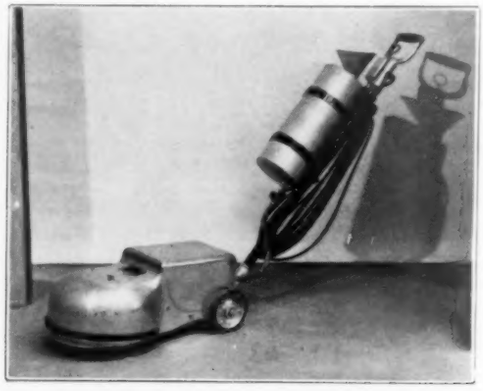
Use—For cleaning and polishing all vitreous, porcelain, white earthenware, baked enamel, or vitreous finish china.

Description—Shiloh Porcelain Cleaner is composed of a carefully blended mixture of soft abrasive and harmless chemicals, designed to properly clean and at the same time polish the vitreous surface. Shiloh contains no ingredients harmful to vitreous surfaces.

MIDLAND MID-CLEAN

Use—For cleaning all types of floors, painted walls and woodwork.

Description—A basic, liquid cleanser, perfectly neutral, which contains no acids or abrasives. Only one fluid ounce to each gallon of soft water will form a perfect solution for cleaning most types of floors, walls, and woodwork. The cleaning is accomplished by a chemical action upon the deposits. The surface is not harmed in any way.



MIDLAND FLOORMASTER SCRUBBING—POLISHING—WAXING MACHINE

A very versatile machine — efficient — economical and silent. Obtainable in 12 or 15 inch brush size. Simple change of brushes makes possible its three uses. Easy to operate.

MIDLAND TILEOLEUM (LIQUID AND POWDER)

Use—Excellent for cleaning tile, marble, terrazzo, slate, concrete and composition floors. Not recommended for use on rubber floors.

Description—There are three types of Tileoleum:

Tileoleum Sassafras, a mild liquid with powerful cleansing action, scented with sassafras.

Tileoleum Pine, a liquid cleanser for use in making stock scrubbing solutions. It contains pine oil.

Tileoleum Powder, a finely granulated, powerful preparation for use in removing rust, paint and metal stains from Tile, Terrazzo and Marble floors and walls.

Midland Tileoleums will not attack or effect the bond or tone of delicate, colorful installations.

PLEASE TURN TO PAGE 322 FOR OTHER EXCLUSIVE MIDLAND PRODUCTS

THE AMERICAN CRAYON COMPANY

Manufacturers of a Quality Line of Floor Finishes

Sandusky, Ohio

BRANCH OFFICES

New York, N. Y., 200 Fifth Avenue Dallas, Tex., Santa Fe Building San Francisco, Calif., 116 New Montgomery St.

• KAYSAN—THE PERFECT FINISH FOR EVERY HARD-SERVICE CONDITION

KAYSAN is manufactured by the makers of the first penetrating varnish developed for heavy-duty, hard-service floors. It is recommended without reservation for schools, stores, factories, offices, clubs, public buildings, apartment houses and similar types of buildings where floors receive excessive wear but must be attractive and in keeping with their surroundings.

quickly enough so second application can be put on about two hours after the first. In the case of a third application, this third application can also be put on about two hours after the second.

It is a very durable finish which does not water spot, crack or scale off, gather dirt like oil, scratch or mar, need wet scrubbing, nor increase the fire hazard.

It applies easily, seals the wood, prevents slipping, gives a lustrous finish and **takes hard wear.**

KAYSAN Has All These Remarkable Qualities

Brings out the full beauty of the grain to a remarkable degree.

Needs never be refinished, but can be repolished with one application of KAYSAN as often as wear requires.

Will not show laps but can be applied to traffic lanes without resanding and refinishing the entire floor.

Dries bone dry and may be polished by friction.

Withstands the hardest usage.

Easily cleaned—reduces maintenance to a minimum.

Reduces time and labor to minimum as it sets up

KAYSAN allows the wood to more nearly retain its natural wood appearance than any other finish.

Cost of Application

Its ease of application and minimum cost of maintenance, makes cost of finishing with KAYSAN very economical.

Covering Capacity

Under average conditions, 1 gallon of KAYSAN finishes on oak, approximately 300 square feet with three applications; on maple, 400 square feet with two applications.

OTHER OLD FAITHFUL FINISHES

• FILTITE—An excellent sealer for old cement and similar surfaces.

• KAY-BRITE WAX (dries with a shine without polishing) and KAY-WAX Paste Floor Waxes.

• TRAZATITE—A Terrazzo sealer and finish.

• OLD FAITHFUL PRODUCTS

Backed by 103 Years of Successful, Expert Manufacturing Experience

1835–1938

OLD FAITHFUL

Also Crayons, Water Colors, Pencils, Inks, Pastes, and other Old Faithful Products

• Reg. U. S. Pat. Off.

THE SELIG COMPANY

Atlanta — Dallas

Manufacturers of

Disinfectants — Insecticides — Sanitary Supplies

ESTABLISHED 1896

Library, Agnes Scott College, Decatur, Ga.
Asphalt Tile Floor finished with O-Brite-O

O-BRITE-O

Those desiring a really fine self-polishing wax will find O-Brite-O to be above the usual. O-Brite-O really dries with a shine. Because of its unusually high content of the finest number one pure Carnauba wax unadulterated by cheaper, inferior soft waxes; O-Brite-O, when dry, leaves a hard resilient long wearing surface. It is easily maintained and not only wears well but looks well. A trial will certainly convince you. O-BRITE-O IS SAFE TO USE ON ANY TYPE OF FLOOR.

VARNAWAX

A high grade wax of strictly number one pure refined Carnauba wax combined with certain varnish gums in an oil solvent vehicle. Varnawax produces a hard resilient, water proof surface that looks well and wears well. Varnawax requires polishing and may be used on all floors except asphalt and rubber or other floors harmed by an oil solvent.

SCRUBZOL

A strictly neutral linseed oil cleanser especially developed and approved for cleaning Wood, Linoleum, Cork, Asphalt Tile, Marble, Terrazzo, Travertine, Magnesite, Masonite and other similar floors. Scrubzol is a concentrated product thus permitting a little to go a long way and do a big job—satisfactorily and economically. Don't take our word for it. Try it and prove it to your own satisfaction.

VARNASEAL

You'll find the answer to your Terrazzo and Travertine problems in Varnaseal. Seal these floors against the entrance of dirt, grease, oil, stains and foreign matter with Varnaseal. It is easy to apply, makes maintenance easier and gives your Terrazzo or Travertine the kind of protection needed. Lower your maintenance costs with Varnaseal.

Below: Gymnasium, Lee Edwards School, Asheville, N. C.

Finished with Selig's JIM KOTE

JIM KOTE

A mighty fine, chemically balanced bakelite and tung oil gymnasium finish. Does not rubber burn, impervious to alkali, salt water, alcohol and common acids. Easily maintained. Plenty of traction. An ideal finish. Our numerous satisfied customers are, we believe, the best judges. Their complete satisfaction makes us believe you also will be. Jim Kote is easily applied.

FLOR-O-SEAL

Especially developed for classroom use. This penetrating seal, when properly applied, does not leave a surface film. Thus, Flor-O-Seal does not show unsightly traffic lanes. It wears well, is easily maintained and is economical. The application is very easy and simple.

FLOOR MAINTENANCE SERVICE

The SELIG trained and experienced floor maintenance engineers are qualified to assist you in any problem of scientific floor finishing and maintenance. They will gladly assist you in setting up the proper and most economical schedule of maintenance. Please discuss your problems with us freely.

We manufacture a complete line of floor maintenance materials and equipment. Our various materials have been approved by the leading makers of flooring materials such as Wood, Linoleum, Cork, Rubber and Asphalt Tile, Marble, Terrazzo, Magnesite, Masonite, etc.

DISINFECTANTS — INSECTICIDES — LIQUID TOILET SOAPS

In addition to the famous line of floor materials, the name SELIG has been synonymous with the highest standards of Disinfectants, Insecticides, Liquid Toilet Soaps and Sanitary Supplies for over forty years.

Put your problems up to us and permit us to offer suggestions and advice. There's no obligation involved and it may be of mutual benefit. Write for our big free complete catalogue.

THE SELIG COMPANY

Atlanta — Dallas

Manufacturers of

Floor Finishes — Waxes — Cleansers — Polishes

ESTABLISHED 1896

CONTINENTAL CAR-NA-VAR CORPORATION

1527–29 E. National Ave., Brazil, Indiana

WAREHOUSES AND EXPERIENCED FLOOR MAINTENANCE ENGINEERS IN PRINCIPAL CITIES OF THE U. S. A.

World's Largest Manufacturers Specializing in Floor Treatments for Large Floor Areas in Schools and Universities

(From an Actual Photograph)

CAR-NA-VAR

TRADE MARK REG. U.S. PAT. OFF.

THE PERFECT FLOOR TREATMENT

MOST DURABLE FLOOR TREATMENT EVER MADE

Car-Na-Var is the original varnish-gum and wax floor treatment that combines the durability and great adhering qualities of varnish with the scratch-resisting qualities of wax so that friction actually enhances the polish. However, long wear and low maintenance costs are not the only reasons Car-Na-Var has become the choice of hospitals, schools and office buildings everywhere. It gives a beautiful, lustrous **waterproof** finish to all types of floors . . . and it is non-slippery. Car-Na-Var requires no undercoat of sealer . . . although it is readily applied over any seal. (Meets U. S. Treasury specifications for "Undercoater A.") Use Car-Na-Var if you have an electric floor machine and the necessary labor available for an occasional buffing. It requires more initial labor than a self-polishing wax, but is much longer lasting. Applied with a mop. Ready for use in an hour. Supplied in "natural" (stainless), Dark Oak, Light Oak, Walnut, Cherry, Mahogany, Maroon, Olive Green and Mission.

CAR-NA-LAC

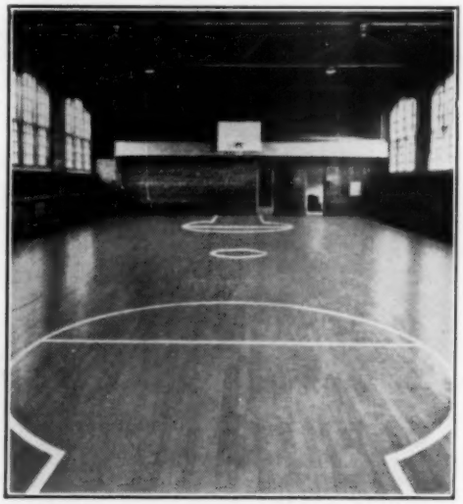
TRADE MARK REG. U.S. PAT. OFF.

LACQUER-LIKE FLOOR FINISH

APPLIED LIKE LIQUID WAX—DRIES LIKE LACQUER

If you do not have a floor machine or buffer, use Car-Na-Lac. It is easily applied with mop or cloth. Goes on like lacquer . . . leveling itself out to a brilliant, streakless lustre. It dries like wax . . . in less than 30 minutes. Car-Na-Lac is "self-polishing" . . . it does not require any buffing. As it seasons, the surface takes on a higher sheen . . . improving with age. Ability to resist traffic scuffs increases. As with Car-Na-Var, worn traffic lanes are easily repaired without showing overlaps. Car-Na-Lac gives a finish of permanent beauty to all types of smooth, sealed or fairly non-porous floors.

Car-Na-Lac is radically different from all other self-polishing floor treatments. It is in effect, a lacquer made of wax . . . self-leveling, firmly adhering to the floor. Hot water won't harm Car-Na-Lac. It's waterproof! May even be used on outdoor surfaces . . . meets U. S. Treasury Dept. specifications for "Finish Material" (except for percentage of solid contents).



CAR-NA-SEAL

TRADE MARK REG. U.S. PAT. OFF.

WEARS LIKE LEATHER

DEVELOPED FOR GYM FLOORS

Made from Bakelite and other phenolic gums. A deep-penetrating seal for all wood floors—tough as leather yet thoroughly pliable—that gives a smooth, satin-like lustre, free from streaks and scratches. Such marks as may appear are readily rubbed out. Preserves the floor by excluding moisture and dirt from the pores while protecting the surface from rough usage. Excellent for school desks.

Although used frequently as an undercoater for Car-Na-Lac and Car-Na-Var, Car-Na-Seal is an ideal top dressing for gymnasium floors. Provides a firm, safe footing. No danger from slipping. Marks left by rubber soles (rubber burns) easily removed with mop. Protects markings of basketball court, etc. Alkali and Acid resisting.

Car-Na-Seal is quickly applied with a lamb's wool mop. No buffing is required. First coat covers 300 sq. ft. per gal.; 2nd coat 600 sq. ft. Original treatment of two coats is usually sufficient for entire season for a gym floor.

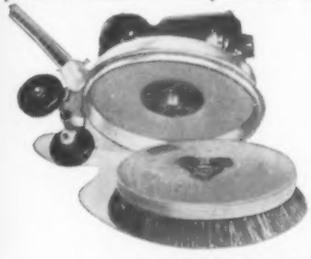
Meets U. S. Treasury Specifications for Sealer C.

"SILENT CHIEF" FLOOR MACHINE

Polishes — Scrubs — Sandpapers — Smooths with Steel Wool — Grinds — Washes Carpets

Above—Scrubbing Solution Tank May be attached to any Silent Chief Floor Machine

The last word in floor machine efficiency—the "Tri-C" Silent Chief—Because the entire weight rests on the brush. Swift and silent because of a special Geared-Head Motor. Easy to operate because of scientific single brush design and perfect balance. Adjustable wheel carriage—safety switch—dust-proof mechanism — adjustable handle connection and other important features. **"Meets U. S. Specifications."**



(Note: Any Silent Chief now in use can be converted for scrubbing carpets at a small charge.)

Note felt padded aluminum disc. Absorbs sound and keeps driving unit clean.

SPECIFICATIONS FOR THREE SIZES

Brush Width	13½ in.	15 in.	18 in.
Weight	63 lbs.	87 lbs.	147 lbs.
Cord Length	40 ft.	40 ft.	50 ft.
Motor	¼ or ⅓ H.P.	⅓ or ½ H.P.	¾ H.P.

GUARANTEE: Every Silent Chief Floor Machine is guaranteed for one year against defective parts and workmanship.

CAR-NA-VAR VACUUM SCRUBBING MACHINES

For scrubbing all types of floors, as well as rugs and carpets. Scrubs and automatically picks up dirty solution. The only vacuum scrubber which operates sideways as well as backward and forward. Also adapted for dry vacuum cleaning.

FLOOR MACHINE ATTACHMENTS

The attachments below are slipped into place on the Silent Chief in a few seconds' time. They are firmly held in place by a positive locking device—yet disengage instantly when properly released.

Bassine Scrubbing or Palmetto Waxing or Tampico Polishing Brushes

Whirl Feed Carpet Shampoo Brush

For cleaning rugs and carpets. Solution is fed through well in center of revolving brush and ejected into bristles "pre-sudsed"

U. S. Pat. 2039356

Steel Wire Brush

Steel Wire Brush. For scrubbing concrete floors and removing varnish

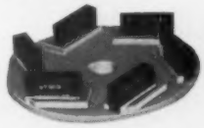
Sanding Disc

Sanding Disc. For sandpapering wood or cork tile floors

Steel Wool

Steel Wool. For removing old wax or "burnishing" new finish to give hard, bright surface

Grinding Disc



Grinding Disc. For re-surfacing uneven or pitted terrazzo, composition and other hard floors

CAR-NA-VAR PORTABLE VACUUM MACHINE

75% GREATER "PICK-UP" THAN OTHERS

With the new reversible, double-action nozzle . . . an exclusive Car-Na-Var feature . . . this new portable machine is now by far the most efficient heavy-duty vacuum on the market. Comparative tests show an actual increase in efficiency of 75% in picking up either dust or water from floors, rugs or carpeting. Squeegee extends slightly below the 13" aluminum nozzle . . . hanging from axle inside mouth. When nozzle is pulled toward operator, squeegee flips back, closing suction behind and diverting it in front where water or dust is collecting. When nozzle is pushed away, squeegee flips in opposite direction and diverts suction ahead. In each instance, the dust or water "piles up" **underneath** nozzle where it is quickly picked up.

WEST DISINFECTING COMPANY

Products for the Promotion of Sanitation

42-16 Barn Street, Long Island City, New York

BRANCHES IN PRINCIPAL CITIES

SCOPE OF WEST SERVICE

The West Disinfecting Company has cooperated for the last half century with the Directors of Schools by studying their sanitation problems and needs, with the result that a group of standardized products for the promotion of sanitation has been developed.

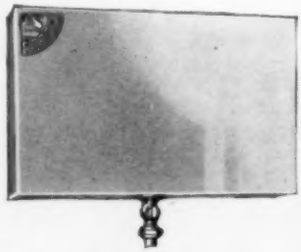
The West Disinfecting Company offers hundreds of products designed to fill nearly every need of modern institutions for healthful cleanliness. Some of the principal products are briefly described on this page, but we suggest that you send for our special literature on any of the products listed for more detailed information.

Disinfectants
Liquid Soaps
Paper Towels
Insecticides
Cleansers
Deodorants
Kotex Vending Cabinets
Floor Maintenance Products

WEST LIQUID SOAPS

The West Disinfecting Company was a pioneer in the manufacture of liquid soaps and today produces uniform soap of superior quality. Made of pure vegetable oils, the finished product is treated, aged and re-tested several times before leaving the factory.

West Liquid Soaps will not irritate or dry the skin. This is particularly important during the winter months when the pores are contracted so they cannot carry to the surface the oils which lubricate the skin. West Liquid Soaps form a full smooth lather which soothes the skin as it cleanses.

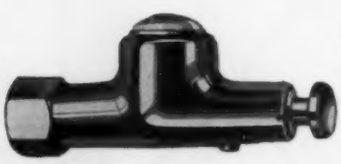


The use of liquid soap, besides being sanitary and safer, eliminates the waste of partially used cake soap which is thrown or taken away.

The West Soaparatus system, due to its flexibility, is admirably adapted to varying conditions of installation. One tank may be used to supply any number of valves, and extensions may be made as required, provided they are at a level at least a foot lower than the location of the supply tank in order to provide proper gravity flow.

Soaparatus Tanks are made of vitreous china, vitreous enamel on welded sheet iron or white enamel on rustproof sheet metal, and are designed to cover a minimum amount of wall space.

SOAPARATUS VALVE



The Soaparatus Valve has been perfected to perform with certainty and mechanical precision and will render uninterrupted service. The patented dome, or air chamber, at the top of the valve causes a uniform predetermined quantity of soap to be ejected smoothly, without splashing or squirting.

LATHERATOR

The Latherator Liquid Soap valve automatically agitates the soap into a rich, creamy lather before it leaves the outlet. Tests show that a gallon of soap will wash from 40% to 50% more hands when dispensed through a Latherator. The West Latherator will function under the hardest kind of usage and the mechanism is sealed in to prevent tampering.

KOTEX VENDING MACHINES

The demand for coin-operated Kotex Vending Cabinets in the girls' rest rooms of high schools, preparatory schools and colleges is ever increasing.

The Kotex pad dispensed from the Vending Cabinet is the same product so favorably known to all women through sale in the stores. Each pad, however, is individually wrapped in a sealed envelope in which are enclosed two safety pins. The presence of Kotex Personal Service Cabinets has been found to reduce absences to a marked degree. For more detailed information on this subject ask for our special folder on "Kotex Vending Cabinets."

FLOOR MAINTENANCE PRODUCTS

The West Disinfecting Company offers a complete line of products particularly suited to preserve and maintain all types of floors.

There are three different steps required to properly care for floors. The first step is to clean the surface thoroughly, removing all dirt and foreign substance. The second step in floor maintenance is the sealing of floors, as floor surfaces are porous to a degree. Unless the pores are sealed, dirt and moisture will settle in them, and under the pressure of traffic, this dirt will be ground in, shortening the life of the surface and marring its appearance. The third step in proper floor maintenance is the application of a finishing coat. Wax is the approved floor finish for all types of floors, as a waxed surface does not hold the dirt, and can be easily and thoroughly cleaned. A waxed floor surface is easily renewed, because the finish coat should take the brunt of traffic and wear, so that the floor itself may be preserved.

Every West Disinfecting Company salesman receives expert training on floor maintenance and in cases where special problems arise, you may consult the salesman for competent, unbiased advice. Ask for our special booklet, "The Proper Maintenance of Floors," for a thorough study of the subject.

THE FAY COMPANY

128–130 Madison Ave., New York, N. Y.

FAY ELECTRIC FLOOR MACHINES FOR

Waxing—Polishing—Scrubbing—Sanding

OTHER FAY ELECTRIC FLOOR MACHINE MODELS

DIAMOND MODEL
¼ H.P. Universal 2 Brush Machine
Weight on brushes 20 lbs.

ROYAL MODEL
⅓ and ½ H.P. A.C. or D.C.
Spread of brush 13½ in.
Weight on brush 85 and 95 lbs.

JUMBO MODEL
½ and ¾ H.P. A.C. or D.C.
Spread of brush 15½ in.
Weight on brush 120 and 135 lbs.

CHAMPION MODEL
¼ H.P. A.C. or D.C.
Spread of brush 11 in.
Weight on brush 60 lbs.

MAJESTIC MODEL

A REAL FLOOR MACHINE FOR LARGE EDUCATIONAL INSTITUTIONS

SPECIFICATIONS

Brushes—18" diameter with spread of fibre on floor of 20". Veneer wood block with two inch trim of fibre.
Brush Speed—125 Revolutions Per Minute.
Pressure on Floor—150 pounds in operation.
Motor—1 Horse Power Standard Horizontal Type Continuous Load.
Drive—Spiral bevel and Helical Cut Gears.
Ball Bearings—Thrust Type. Lubricated by Grease Cups.
Housing—Aluminum Casting 5/16" thick. 19¼" Outside Diameter.
Handle—Adjustable Fork Type.
Bumper—White Moulded Rubber ⅝" Thick.
Wheels—4" Diameter Hard Rubber with Soft Tread.
Cable—40 feet No. 14 Rubber Covered.

THE AMERICAN SCHOOL AND UNIVERSITY

GENERAL FLOORCRAFT, INC.

333 Sixth Ave., New York City

The Low Cost Quality Line

A SIZE TO SUIT EVERY NEED AND BUDGET

GENERAL SINGLE-BRUSH LOW TONE FLOOR MACHINE

HEAVY DUTY **ALL GEAR DRIVE**

POWERFUL — EFFICIENT — NOISELESS — The primary function of any electric floor machine is performance of its duties efficiently at lowest cost. More power and more speed assure efficiency and economy.

To obtain all these advantages, the **Low Tone General** single brush, gear-driven electric floor machines are **correctly engineered** and designed, so that maximum motor power is actually utilized in performance of floor work. All gears are fully enclosed in grease leak-proof housing. No waste in complicated construction.

Low Tone General floor machines are powered by motors of rugged and modern design and have unusual quick starting action and reserve power. Perfect balance and simplicity of construction are features of this modern floor servant.

Made in Six Distinct Models

SPECIFICATIONS

	Model S-11	Model S-13	Model S-15 Jr.	Model S-15 Sr.	Model S-18 Jr.	Model S-18 Sr.
Motor (Repulsion-Induction)	¼ H.P.	⅓ H.P.	⅓ H.P.	½ H.P.	½ H.P.	¾ H.P.
Brush Diameter.	Full 11″	Full 13″	Full 15″	Full 15″	Full 18″	Full 18″
R.P.M. of Brush	170	170	170	170	150	150
Pressure on Brush Complete	45 lbs.	75 lbs.	85 lbs.	95 lbs.	100 lbs.	110 lbs.
Cable Length ..	40 ft.	40 ft.	40 ft.	40 ft.	40 ft.	40 ft.

One Year Guarantee

Made in four sizes—11″, 13″, 15″ and 18″ brush diameter

Waxes · Polishes · Scrubs · Dry Cleans
Refinishes All Types of Floors

You can try the GENERAL on your floors before you buy it
Full information and prices on request

GENERAL TWIN-BRUSH "NOISELESS" FLOOR MACHINE

The **General** Twin-Brush Models were designed and developed to meet a very specific need—permanent quietness of operation, in schools and institutions where quiet is essential. These twin-brush models have no gears, no chains, no grease. They are driven by a series of heavy-duty multi-V belts and carry a permanent guarantee against noisy operation. They are even quieter in operation than the Single-Brush "Quiet" model, without sacrificing any mechanical engineering qualities that have made this "Quiet" model the choice of so many schools in the past. **Guaranteed Permanently Noiseless.**

Made in three sizes—14″, 18″ and 22″ brush spread

FREE TRIAL OFFER

The many advantages of the **General** line of floor machines may be seen on your own school floors. You can try a **General** before you buy one. Our representative will call to demonstrate, or, if you prefer, a ten-day FREE trial of any model can be arranged—without obligation to buy.

Agents or Dealers in all Principal Cities

THE AMERICAN SCHOOL AND UNIVERSITY

THE KENT COMPANY, INC.

174 Canal Street, Rome, N. Y.

BRANCHES IN PRINCIPAL CITIES

THE KENT FAST CLEANING TEAM

Modern school floors do much to improve building appearance. It is easy to preserve and keep such floors looking their best. Many of the newer types in common use require special treatment. The increasing number of schools using Kent Electric Floor Machines testifies to their popularity for such purposes. They do a complete maintenance job, which includes the scrubbing, waxing, polishing, buffing and sanding. Speed of performance saves valuable time and money.

THE MODEL C15

POPULAR SCHOOL SIZE

QUIET

FLOATING POWER

MOTOR FULLY ENCLOSED

There are four other quality Kent Models, sizes for large and small buildings. Their skillful design incorporates many exclusive features—perfect balance for ease of operation—straight-line drive, reducing number working parts to a minimum. Perfect lubricating system does not employ use of fluid lubricants. Famous feature is the all-weight-on-the-brush principle. Due to their sturdy construction, they give many trouble-free years of service.

Has your school some floor problem we can aid you in solving?

Years devoted to the study of school cleaning problems have gone into the development of Kent Suction Cleaners and their special Attachments for school work.

Used for sweeping, the air the students breathe is free from the dust always present where brooms are used.

Eliminates the use of sweeping compound, meaning a saving.

With the Suction, little hand dusting is necessary.

Chalk trays and mouldings quickly and easily cleaned.

Erasers cleaned without leaving schoolroom.

Picks up small pieces of paper not easily swept with a broom.

Gets dust and dirt from all cracks and crevices.

Special tools for library use, for cleaning expensive drapes, gym mats, walls and carpets.

The Kent Suctions sweep fast, are powerful, compact machines, built to last.

A list of outstanding schools and colleges using Kent Cleaning Equipment available on request.

Established 1898

LINCOLN-SCHLUETER FLOOR-MACHINERY COMPANY, INC.

Phone: Superior {8944 / 8945

Manufacturers

213-221 W. Grand Avenue, Chicago, Ill.

Whether the floor space to be scrubbed, sanded or polished is measured in square feet or acres, there is a Lincoln Machine of the most advanced design and correct size for economical maintenance.

Since these machines are already standard equipment in many of the largest schools and institutions throughout the country, they need but little introduction.

Forty years of successful floor machine manufacturing is built into every Lincoln. Every product in the Lincoln-Schlueter line is correctly designed and ruggedly built.

THE MULTI-PURPOSE FLOOR MACHINE
SANDS—SURFACES—STEEL WOOLS—BUFFS—POLISHES

In small classrooms, or large gymnasiums, assembly halls, school cafeterias—regardless of the size of the floor space—the new 3-in-One Lincoln-Schlueter Multi-Purpose is the perfect machine for sanding, cleaning, steel-wooling or polishing.

As its name implies, the Multi-Purpose Machine is adaptable to a variety of uses—all necessary to the proper preparation and care of wood floors. Made in 2 sizes.

SPECIFICATIONS

9″ SIZE	12″ SIZE
Motor—1 H.P., ball-bearing.	**Motor**—1½ H.P., ball-bearing
Drum—9″ wide, speed 1000 R.P.M.	**Drum**—12″ wide, speed 1000 R.P.M.
Dust Collector — Ball-bearing, highly efficient.	**Dust Collector** — Ball-bearing, highly efficient.
Weight—125 lbs.	**Weight**—200 lbs.
Drive — ''V'' belt, positive, smooth, and silent.	**Drive** — ''V'' belt, positive, smooth, and silent.
Equipment—50 ft. extension cable, dust bag, sand paper, steel wool, polishing brush, wrenches, etc.	**Equipment**—50 ft. extension cable, dust bag, sand paper, steel wool, polishing brush, wrenches, etc.

The small illustration below shows a Multi-Purpose steel wooling off the black dirty accumulation found on a classroom floor that has been excessively oiled

LINCOLN TWIN-DISC TYPE NO. 16

This model is recommended for smaller schools for cleaning, scrubbing or polishing. It has two 8-inch diameter brushes covering a floor span of sixteen inches, yet the machine is so compact that it may be used in congested areas or in primary grade rooms with complete satisfaction.

Handle may be set to allow the machine to pass under low furniture, desks, etc.

Average capacity of the Type No. 16 is from 1500 to 2000 square feet per hour.

LINCOLN TWIN-DISC TYPE NO. 20

This type is recommended for the larger grade school, and especially for scrubbing and polishing floors in assembly halls, corridors, gymnasiums, etc.

This model has two 10½ inch diameter brushes which cover a total floor span of 21 inches overall. The machine is powered by a ½ H.P. heavy-duty ball-bearing motor. A 5-gallon water tank with lever control for water feed, as illustrated, is optional equipment.

Average capacity of the Type No. 20 is from 2500 to 3500 square feet per hour.

There are 12 models of Lincoln Floor Machines — one of which will fit your requirements exactly

WRITE TODAY FOR COMPLETE DESCRIPTIVE CATALOG AND DETAILS OF FREE TRIAL OFFER

THE AMERICAN SCHOOL AND UNIVERSITY

G. H. TENNANT COMPANY

Established 1870

GENERAL OFFICE AND FACTORY

Minneapolis, Minn.

EASTERN SALES OFFICE: Westfield, N. J.

THE TENNANT FLOOR MAINTENANCE SYSTEM

The Tennant Floor Maintenance System offers a scientifically correct procedure for the treatment of new wood floors and for the re-conditioning, cleaning, maintaining and re-finishing of old floors.

During the short time this modern process has been on the market it has been adopted as the standard floor maintenance method by school systems in all parts of the country, by the United States Government and by leading industrial firms.

The Tennant System is entirely different from any other floor maintenance process.

Further information, with illustrated circular, will be sent on request. One of our trained floor experts will gladly demonstrate the Tennant System for you, and tell you of floors in your own locality maintained by Tennant Dry Cleaning.

THE TENNANT FLOOR MACHINE—MODEL C

Can be Used with 8″ or 16″ Steel Wool Rolls, 8″ Sanding Drum, 8″ or 16″ Scrubbing or Polishing Brushes Dustless Dry Cleaning . . . Dustless Sanding . . . Polishes Waxes . . . Seals and Burnishes . . . Scrubs

Demonstration of Tennant System of Floor Maintenance at Convention of National Association of Public School Business Officials

INVINCIBLE VACUUM CLEANER MFG. CO.

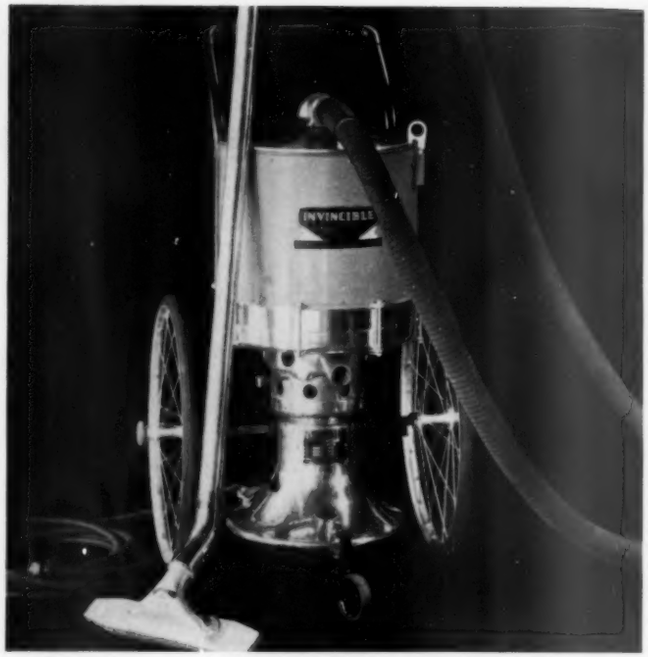
5000 Davis St., Dover, Ohio

INVINCIBLE HEAVY DUTY PORTABLE VACUUM CLEANERS FOR SCHOOLS

In schools, colleges, universities and buildings everywhere, Invincible Cleaners are affording the highest standard of cleanliness at a remarkably low yearly cost. Powerful suction completely removes all dust and dirt from any surface within the building. Although rugged, "Invincibles" are compact, light in weight and extremely portable. Thus, they are easy to use in congested areas, and immaculate cleanliness is accomplished with an actual saving in time.

Application—Invincible Vacuum Cleaners thoroughly and quickly clean every kind of floor, walls, furniture, chalk troughs, erasers, shelves, stairs, boiler rooms, and, in fact, every surface. A wide assortment of tools is offered to meet any cleaning need properly. The Invincible Tool Swivel enables operators to easily and quickly clean under desks, furniture, and in corners, etc.

Results—Aside from immaculate cleanliness and rapid cleaning, "Invincibles" completely remove the fine dust from the minute pores in flooring. This prevents wear under traffic and no dust remains to be scattered into the air to accumulate on walls, equipment, etc. Cleaning and redecorating costs are reduced, and even the atmosphere is cleaner.

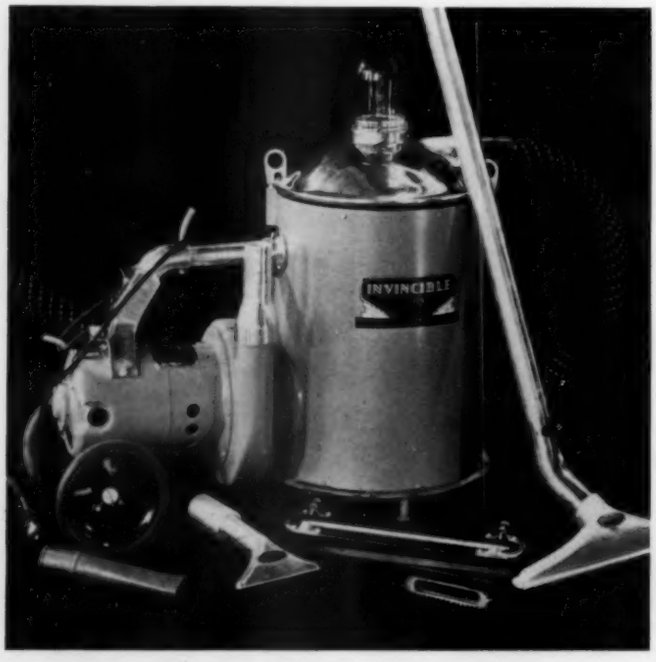


INVINCIBLE UNIVERSAL PORTABLE (Above)

This ¾ horsepower unit develops tremendous cleaning power and is designed for use where thorough cleanliness must be accomplished in the least possible time. Its sturdy, rugged construction, with no overhanging parts, no stress, no strain, is approved by engineers throughout the world.

Mounted on its large, swivel-wheeled carriage, it is extremely portable, and it is not necessary to use long lengths of cumbersome hose, which saves time, and it may be easily wheeled up and down stairs. There are no exposed or inflated bags to permit dust seepage, or to handicap the operator. All dust and dirt is securely held in one large, metal-enclosed container which can be removed, emptied and replaced in less than ½ minute.

Picking up abrasive dirt or metallic litter cannot injure this machine in any way, as all separation takes place before the air reaches the vacuum producer. Hence, there is no wear or tear on the mechanical parts, and unvarying efficiency is assured. This machine will give years and years of dependable, efficient service.



INVINCIBLE ALL-SERVICE (At left)

This ½ horsepower, heavy-duty model is smaller and lighter in weight than the Universal Portable, yet it embodies all of the superior Invincible Features—totally enclosed separation unit, lightness, compactness, extreme portability, ease of operation and sturdy construction. It is a remarkably efficient heavy-duty cleaner at a surprisingly low cost.

Although the two units shown are the most widely used in schools, there are eight other "Invincibles"—ten in all. There is an Invincible Model that will exactly meet any cleaning requirement, small or large. We shall gladly furnish complete information, recommendation and quotation on request.

THE SPENCER TURBINE COMPANY

Hartford, Connecticut

THE SPENCER CENTRAL VACUUM CLEANING SYSTEM

The Spencer Central Vacuum Cleaning System has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Spencer Central Vacuum Cleaning is a permanently installed system for the speedy and complete removal of dirt and dust from all kinds of floors, walls, ceilings, furniture and other building equipment. It consists of five essential parts, each carefully selected to meet the special requirements for each individual building:

1. A vacuum producer, located in the basement. 2. Inlet valves, conveniently located on all floors and piped to vacuum producer. 3. Specially designed, entirely enclosed, and easily cleaned separator. 4. Light weight, flexible hose. 5. Special vacuum tools for each operator.

Central System

Spencer Vacuum Producers—The Spencer Vacuum Producer is of the turbine type but differs from most turbine exhausters in that it is designed and built especially for vacuum cleaning.

The impellers are made of the best sheet steel or duralumin; carefully balanced and tested. They are so proportioned that they will not clog or wear out and are mounted in the turbine casing with extra wide clearances on both sides. The use of several impellers in series makes it possible to obtain any desired volume and vacuum with low peripheral speeds.

Separators—The principle of centrifugal separation is standard on Spencer Systems. It has been found from actual tests that centrifugal separators will separate from 95% to 98% of the dust which is picked up by the cleaning tool.

Tools — Spencer tools are designed with openings in correct proportion to the rest of the system; also with special consideration as to convenience and fitness of the various requirements. Strong in construction, light in weight, and shaped for fast and effective work. Tools are equipped with Spencer universal controllable swivel, which enables operator to remove dirt beyond the reach of the rigid tool. All wearing surfaces are renewable. Tools are attached to handle by means of a convenient locking chuck.

Advantages—In exhaustive tests in leading schools, the powerful vacuum, scientifically applied with correct tools, has demonstrated its ability to remove more of the dirt in less time than other methods.

Because the equipment is simple in design, requiring little attention and because these systems are built to provide satisfactory service over long terms of years, both the operating and amortisation costs are extremely low.

One janitor can clean twelve average sized class rooms in two hours with a 3 Hp. Spencer System. The Spencer elbow joint makes cleaning around furniture easy.

For Cleaning Erasers and Chalk Trays—The Spencer Central System, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of eraser or chalk tray.

Cleans the Boiler Room—This system cleans boiler room floors—removes dust and soot from pipes and draws soot out of the boiler tubes, often saving the whole cost of operation in this one item alone.

Swimming Pool Cleaning Equipment—By means of special cleaning tools usually employed in connection with the pump on the filtering system it is possible to remove accumulated sediment from swimming pools without the waste of water involved in draining the pool. Bulletin on request.

Booklet—A number of Spencer-cleaned schools are illustrated in our booklet, sent on request.

Heavy Duty Portables—A new light weight portable vacuum cleaner using the same type of vacuum producer and the same tools is available at low cost for small public and private schools. Demonstrations available on request. Write for the pamphlet.

SPENCER PORTABLES

ALLAN J. COLEMAN

Manufacturers of Sewer, Pipe, Closet and Drain Cleaning Tools

120 W. Illinois St., Chicago, Ill.

Flexible Closet Cleaners

COIL WIRE CLOSET CLEANER

Instantly removes obstructions from water closets, drain pipes, etc.

Grade A

C-510-515. Flexible Coil made of a special prepared non-corrosive **Swedish Spring Steel Music Wire** No. 12 gauge, ½" size, with removable corkscrew and cone wire.

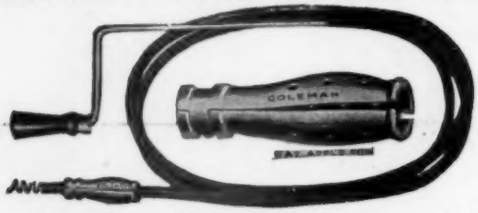
C-510—3-ft. Music Steel Wire Spring $4.50
C-515—6-ft. Music Steel Wire Spring 5.50

Grade B

Made of good oil-tempered steel, 12-gauge wire ½-in. size.

C-516—3-ft. coil, black enameled... $3.50
C-517—6-ft. coil, black enameled... 4.50

FLEXIBLE COIL WIRE SEWER AND PIPE AUGERS WITH AUTOMATIC GRIP HANDLE



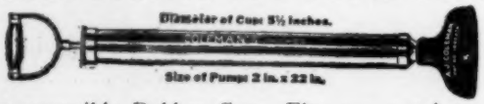
For use in removing obstructions in vacuum, drain pipes or sewers. Made of the best oil-tempered spring steel, and are flexible, enabling them to turn bends and go through traps. Made with cork-screw and handle complete, also furnished with automatic grip handle.

Style No.	Size, Ins.	6-Ft. Lgth.	9-Ft. Lgth.	15-Ft. Lgth.	25-Ft. Lgth.	50-Ft. Lgth.	100-Ft. Lgth.
C-520a	3/16"		$1.25		$2.25	$3.80	$6.80
C-520b	¼"		1.55		2.70	4.25	7.65
C-520	⅜"	$2.00	2.70	$4.50	6.75	10.20	17.00
C-525	½"	2.25	2.90	4.95	7.20	12.75	21.25
C-528	⅝"			5.85	8.10	13.60	25.50

		Price
C-530—¾",	10-ft. sec., hdl. and corkscrew	$5.50
	Extra 10-foot section	5.00
C-535—1",	10-ft. sec., hdl. and corkscrew	6.50
	Extra 10-foot section	6.00

Nos. 530 and 535 are furnished with handles and corkscrews and all connections. Made in 10-foot sections.

BRASS SUCTION AND FORCE PUMP

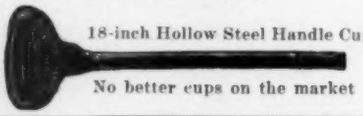


Large reversible Rubber Cup. Fits any opening up to 5 inches. Wonderful article for opening sinks and drains.

C-500—Pump with Cup. Weight, 6 lbs. ..... Each $12.00
C-505—Cup only. Weight, 1 lb. ..... Each 1.50
C-508—Graphite packing rings ..... Per set 1.50

SUCTION AND FORCE CUPS

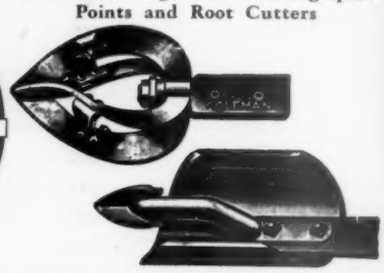
High grade rubber. All handles secured to Cup by threads and sockets.



No better cups on the market

Style No.	Size, Ins.	Color	Wood Handles, Ins.	Price Per Doz.
C-545	5½	Red	Steel 18	$24.00
C-550	5½	Red	Cup Only	18.00
C-555	5½	Red	Wood 30	15.00
C-560	5½	Black	Wood 30	12.00
C-565	4½	Red	Wood 30	9.00
C-570	4½	Black	Wood 30	7.80

Giant Revolving Sewer Cleaning Spear Points and Root Cutters



For cleaning out straight sewers or drains. Made of a special oil-tempered, flat spring, steel wire. Equipped with spear point, roller ball and grip handles, which increases efficiency. Use either end.

Style No.	Size, Ins.	25-Ft. Length, Each	50-Ft. Length, Each	*75-Ft. Length, Each	*100-Ft. Length, Each
C-532	⅛ x .030	$1.25	$1.75	$2.50	$3.50
C-534	3/16 x .030	1.50	2.50	3.50	4.50
C-536	¼ x 1/16	1.85	3.50	5.00	7.00
C-537	½ x 1/16	2.40	4.50	6.00	8.00
C-538	¾ x 1/16	4.00	6.00	8.00	10.00
C-539	¾ x ⅛	6.00	8.40	12.00	16.00
C-539a	1 x ⅛	7.00	10.20	13.80	18.90
C-540	1¼ x ⅛	7.20	10.80	14.40	20.00
C-542	1½ x ⅛	8.40	12.00	18.00	24.00

* Furnished with Frame. Other lengths, 75 cents extra.

CONDUITS AND SEWER RODS WITH NEW FRICTIONLESS COUPLING

C-543—COLEMAN'S SECTIONAL SEWER AND CONDUIT RODS are made of the best grade of 1⅛" hickory, 3 ft. or 4 ft. lengths, coupled together with Coleman's latest Most Improved "FRICTIONLESS" 1⅛" Certified Malleable Iron Couplings.

Experience has taught us that there is a great amount of friction and drag caused by the Couplings and Rod dragging flat on Pipe.

Repeated tests have caused the development of COLEMAN'S "FRICTIONLESS" COUPLING. Rods touch on four wings or planes on our Improved "FRICTIONLESS" Coupling eliminating this friction and drag to a minimum.

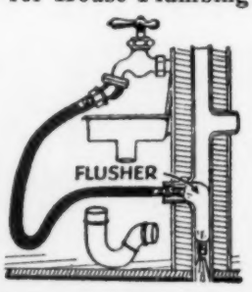
A Heavy Duty Sewer Rod

C-543—Rod with couplings 1⅛" x 3', wt., 2 lbs..... $1.10
C-543a—Rod with couplings 1⅛" x 4', wt., 2¾ lbs..... 1.20
C-625—Rod with couplings ⅞" x 3', wt., 1½ lbs..... .90
C-675—Rod with couplings ⅞" x 4', wt., 1¾ lbs..... 1.00

Tools for Above Rods. Write for Prices

HYDRAULIC FLUSHER

House Faucet Connection. Standard Size of Flusher for House Plumbing That Gives Results.



This Sewer Flusher is made of several plies of water-tight heavy rubberized fabric which makes it Strong, Durable and Flexible, easy to insert into traps, vents, curved sewer drains or pipes. A very efficient article when it is necessary to wash out pipes or sewers. When connected with strong water pressure, flusher is expanded to size of drain, thereby giving a direct water pressure close to stoppage. Sizes to fit all pipes. Write for prices.

"GUARD HEALTH" By Using COLEMAN'S Tools to Keep Sewer Drains Running Freely and Have Sanitary Buildings

MILLIONS OF SQUARE FEET OF
FLOORS Without FLAWS
LINOLEUM
WOOD
CONCRETE
RUBBER
TERRAZZO
MAGNESITE COMPOSITION
TILE
MARBLE
Modern Maintenance Methods
LONG ISLAND CITY, N.Y.
A.C. HORN COMPANY
by
HORN
ASPHALT TILE
CORK
FAIRCHILD AERIAL SURVEYS INC. N.Y.C.

A HORN PRODUCT

FOREWORD

In presenting MODERN MAINTENANCE METHODS we have recognized the long-felt need for a practical guide for the economical and efficient care of floors of all types in schools, colleges, institutions and office buildings.

The development of new types of flooring materials, the increased service to which floors are subject and the wide-spread demand from school superintendents, building owners and managers for better looking floors—has created a need for better floor finishing methods.

In back of MODERN METHODS OF FLOOR MAINTENANCE stands the experience gained by the A. C. Horn Company in over forty years of manufacturing and research. It is perhaps unnecessary to mention that both the methods and products have been given the most vigorous practical tests under the supervision of the Horn Laboratories. No more convincing proof of merit and quality can be offered, unless it be the enthusiastic reports of hundreds of satisfied users of Horn Products—than this list of nationally known manufacturers of floors and floor coverings, who have through their associations tried, tested and approved the Horn Products for treating and properly maintaining their floors:

Maple Flooring Manufacturers Assn.
Rubber Flooring Manufacturers Assn.
Armstrong Cork Co.
Sloane - Blabon Corp.
American Rubber Products Corp.
Boston Woven Hose & Rubber Co.
B. F. Goodrich Rubber Co.
Hamilton Rubber Co.
Hood Rubber Co.
Puritan Rubber Co.
Quabaug Rubber Co.
W. H. Salisbury & Co.
Members of the National Terrazzo and Mosaic Association.
Stedman Rubber Flooring Co.
Voorhees Rubber Mfg. Co.
Paul Coste Inc.
Manhattan Rubber Mfg. Co. of the Raybestos-Manhattan Inc.
Western Rubber Co.
Republic Rubber Co.
R. C. A. Rubber Co., Inc.
United States Rubber Co.
Art Mosaic & Tile Co.
Architectural Tile & Terrazzo Co.
American Terrazzo & Tile Co.

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WOOD

There are many types of wood floors—maple, beech, birch, pine, ash and oak. Maple, beech, birch and pine are close grained woods. Oak and ash are open grained. Once the grain of the wood is filled, the wearing surfaces become identical. For best results it is essential to condition an old floor, restoring it as closely as possible to the virgin condition of a new floor. Freshly scraped and sanded floors are less of a problem than those coated with oil, varnish or shellac.

TO CONDITION

If oil-soaked.

Disperse oil in the pores by the "saponification method"—that is, change the oil to soap by using HORN D-X CLEANSER and HORNGLAZE CLEANER. Dissolve 1 pound of HORN-D-X CLEANSER in 2 quarts of hot water, then dilute 1/2 gallon of HORNGLAZE CLEANER in 3/4 bucket of hot water and mix the two solutions together. Flush a small area with this combined solution and allow to stand for 2 or 3 minutes. Then scrub with a stiff brush or scrubbing machine, or No. 1 steel wool pads. Thoroughly rinse the treated area with clear water. Repeat the scrubbing and rinsing operations until all oil is removed. If the floor contains excess oil, a second series of scrubbings and rinsings is recommended a week later to remove whatever oil rises to the surface.

If varnished or shellacked and badly worn.

Remove the worn coating by sanding, scraping or use a paint and varnish remover. Clean loosened varnish or shellac from the surface with a strong solution of HORNGLAZE CLEANER. Rinse the surface several times with clear water to remove any unfavorable residue left on the surface by the cleaner and allow the floor to dry thoroughly. Finally wash the surface thoroughly with gasoline or benzine.

To seal New and Old Floors.

New floors and old floors that have been cleaned should always be properly sanded. Apply one coat of Clear or Oak Color HORN FLORCREX with a short cotton strand mop or lambs wool applicator. Rub into the grain of the wood until no surface excess remains. After one hour, steel wool the entire area. (Use No. 1 grade steel wool.) Apply a second light coat of HORN FLORCREX twelve hours later. Again remove the surface excess by steel-wooling the entire area.

Note: *The Maple Flooring Manufacturers Association approve and recommend Horn Florcrex.*

To finish.

Twenty-four hours later apply several thin coats of HORNGLAZE WAX, buffing each coat upon drying. If a tough, wear resistant surface film is preferred; seal with one application of HORN FLORCREX followed by a two coat application of HORN DUOCREX.

GYMNASIUM FLOORS

Follow the above detailed specifications for the treatment of new gymnasium floors as well as gymnasium floors in service. Gymnasium floors should be properly sealed with HORN FLORCREX eliminating the possibilities of checking, splitting and splintering. If a surface finish is desired, a two coat application of HORN DUOCREX is recommended. Game lines should be applied between the HORN FLORCREX and HORN DUOCREX treatment.

FOR DANCING: Apply two coats of HORNGLAZE WAX. To restore the floor for gymnasium service remove the wax coating by mopping with a solution composed of one part of HORNGLAZE CLEANER and 6 parts of hot water.

To remove rubber burns dampen a cloth or mop with a mild solution of HORNGLAZE CLEANER and hot water and apply to the affected areas.

TO FINISH AND POLISH

HORNGLAZE WAX will provide a surface wearing film, and should be applied with a mop or lambs wool applicator, in straight even strokes. Do not rub. Allow 15 minutes to dry before applying succeeding coats. If higher gloss is desired, buff with polishing machine, broom or No. 1 steel wool pad.

TO MAINTAIN

A HORNGLAZE WAX treated floor requires only a "dry cleaning" instead of wet mopping or scrubbing. This hard, tough film prevents dirt and dust from becoming embedded in the pores of the wood. Use a stiff bristle brush or broom instead of the usual push broom to sweep off the surface dust or dirt. Concentrated traffic areas, such as doorways, aisles, under desks, etc., will be the first to show a grinding off of the HORNGLAZE WAX film. Rewax these areas more often. Floors should be stripped of wax coatings about once a year.

LINOLEUM

Linoleum is composed of ground cork, wood flour and pigments. These ingredients are combined with linseed oils and gums as a binder, then pressed onto burlap. The life of the linoleum depends upon the life of the binder. The reconditioning and maintenance of linoleum applies to all types — inlaid, battleship, jaspe and printed.

TO CONDITION

If previously varnished, shellacked or lacquered and badly worn.

If paint and varnish remover is used, care must be exercised, as the excess use of this agent will tend to destroy and weaken the structure of the linoleum. If previous coatings are badly worn they may be removed with a combined solution of HORN D-X CLEANSER (1 lb. to 2 qts. of hot water) and HORNGLAZE CLEANER (1/2 gallon of HORNGLAZE CLEANER and 3/4 bucket of hot water). Scrub the surface thoroughly and remove all loosened coatings with a rubber squeegee, damp mop or rag. Rinse the floor several times with clear water to remove any unfavorable residue and allow to dry thoroughly.

◆

If dirty or previously waxed.

Scrub with HORNGLAZE CLEANER diluted from 2 to 4 parts with hot water. Remove loosened dirt and muck with a damp mop or rag. Use the "double scrub" method for efficiency and economy. Scrub an area of 50 square feet. Mop up the loosened dirt and suds, then rescrub the area and with a rubber squeegee, push the cleaner solution onto the next area. Scrub this second area and pick up the loosened dirt and muck with a mop or rag. Rinse the floor thoroughly to remove any unfavorable residue.

◆

If faded or washed out.

This condition is invariably the result of continued use of improper cleaning agents, such as caustics, strong alkali soaps, powder cleaners, etc. The pores of the linoleum are plugged with an alkali or fatty acid content. This alkali or fatty acid content becomes an actual part of the floor itself. To condition and restore the floor it is essential that a neutralizing agent be used. If the objectionable residue is a fatty acid, neutralize with a safe alkali, such as ammonia, diluted one part of ammonia to ten parts of water. Mop the floor with this solution then rinse several times with clear water.

◆

If an alkali condition is present, neutralize with some safe acid, such as vinegar, diluted one part of vinegar to ten parts of water. Mop the floor with this solution then rinse with clear water and allow to dry thoroughly before applying HORN FLORCREX or HORNGLAZE WAX.

◆

Apply one coat of HORN FLORCREX with a brush, mop or lambs wool applicator. Rub this material into the pores of the linoleum until no excess remains on the surface. The HORN FLORCREX application will serve to reliven the binder and seal the surface against the ingress of dirt, grease, grime and grit.

◆

TO FINISH AND POLISH

Apply HORNGLAZE WAX with a soft cloth, short cotton strand mop, or lambs wool applicator. ***Spread in a thin, even film.*** Do not rub; merely spread in one direction with painting-like strokes. Two thin coats will produce a smoother job than one thick coat. Never use HORNGLAZE WAX too liberally. Allow each coat to dry from 15 to 25 minutes before applying succeeding coat. Where linoleum is in good condition and previous coating is unmarred, apply only one coat. On porous linoleum, where HORN FLORCREX has not been used, dilute first coat of HORNGLAZE WAX 50% with water and apply to clean, dry linoleum.

◆

TO MAINTAIN

Polishing is the proper maintenance method for correctly reconditioned linoleum floors. HORNGLAZE WAX is self-polishing. It produces a harder, tougher, dryer film than ordinary waxes; permitting the "dry cleaning" of the floor, instead of wet mopping. Dirt will not be embedded, and a stiff brush instead of the soft-hair broom will sweep grit and dirt off the surface and repolish it. It is common practice to strip linoleum floors about once a year.. Remove old wax coatings with HORNGLAZE CLEANER, then rewax with HORNGLAZE WAX. For a higher lustre, use a pad of No. 1 steel wool under the brush. Floors so maintained will not require rewaxing for many weeks. Unless floors become very dirty, the wax coating need not be scrubbed off on successive treatments. Concentrated traffic areas, naturally require more frequent waxing. HORNGLAZE WAX STAYS CLEAN LONGER AND LASTS LONGER.

RUBBER

Rubber flooring (tile and sheeting) because of composition and resiliency offers an ideal floor covering. The variety of colors, in solid and marbleized effects affords practical and decorative flooring designs. When correctly maintained rubber flooring will give many years of satisfactory service.

◆

TO CONDITION

CAUTION

Do not use hot water in cleaning or mopping rubber floors. Do not permit water to remain on the floor as it may loosen the tile from the sub floor. Avoid the use of oils, oil mops, jelly or oil soaps and alkali cleaners on rubber floors. Their use will soften and damage the surface. Do not allow gasoline, kerosene, naphtha, turpentine or substances containing these agents, such as spirit type waxes to come in contact with rubber flooring. Do not apply varnish type coatings to rubber flooring.

◆

If dirty or greasy.

Scrub with HORNGLAZE CLEANER, diluted from 2 to 6 parts with cold water. Use a stiff scrubbing brush or No. 1 steel wool pad. Squeegee and mop all loosened dirt and grease from the surface then rinse several times with cold water to remove any unfavorable residue. Allow the floor to dry thoroughly then apply several coats of HORNGLAZE WAX.

◆

If soft or damaged.

Floors damaged or softened by improper treatment and use of incorrect cleaning materials must of necessity be reconditioned. Scrub with a saturated solution of tri-sodium phosphate (2½ lbs. to a gallon of cold water). Pick up loosened dirt with a cotton strand mop and rinse with the same solution. Allow to dry without a final mopping. This conditioning process should be repeated on three to five successive days, at the end of which time the floor should be mopped with a mild solution of HORNGLAZE CLEANER (dilute from 8 to 10 parts with cold water). Rinse the surface with clean cold water, mop and allow to dry before applying HORNGLAZE WAX.

◆

If floor contains cotton fibres.

Certain rubber floors contain cotton fibres. The fibres become impregnated with wax and prevent the developing of an initial lustre. The waxy fibres should be cut off after application of each coat of wax by polishing with No. 1 steel wool pads placed under the electric polishing machine.

◆

TO FINISH AND POLISH

Apply two coats of HORNGLAZE WAX in thin, even films, with a mop or lambs wool applicator. Spread the wax in one direction. Do not rub in. Allow 15 to 20 minutes for each coat to dry. On badly worn and porous areas, apply several coats of HORNGLAZE WAX, diluted with equal parts of cold water. Buff each coat with a stiff brush or a pad of No. 1 steel wool. If a higher lustre is desired, apply several coats of HORNGLAZE WAX undiluted, buffing each coat upon drying.

◆

TO MAINTAIN

Instead of wet mopping, dry-clean the surface, using stiff brushes in place of soft hair brooms. The HORNGLAZE WAX film is so hard and tough that dirt and dust will not become embedded. The use of stiff brushes or steel wool pads will greatly increase the degree of lustre. Periodical scrubbings with HORNGLAZE CLEANER diluted with cold water, followed by an application of HORNGLAZE WAX will eliminate detrimental wet mopping, preserve the beauty and increase the life of rubber floors.

TERRAZZO

Terrazzo is a granolithic flooring in which the top surface is composed of approximately 70% marble chips embedded in Portland or Magnesite cement grout. The surface is honed with grinding stones and finally burnished with brushes to produce a smooth finish.

◆

TO CONDITION

The appearance of a new terrazzo floor is frequently disappointing as the rich, true color of the marble aggregate is masked by a grayish film or efflorescence.

◆

New Terrazzo.

After final grinding, the floors should be cleaned of all construction dirt, paint and plaster stains, etc. Dilute ½ pound of HORN D-X CLEANSER in 10 quarts of hot water and scrub the surface thoroughly. Squeegee off all loosened dirt and rinse the floor with clear water. For a final scrubbing, dissolve one pound of HORN D-X CLEANSER in two quarts of hot water. Dilute ½ gallon of HORNBRITE in a ¾ bucket of hot water. Mix the two solutions together and scrub the floor thoroughly. Use a rubber squeegee to remove the cleaning solution and then rinse the floor thoroughly with clean water.

◆

When dry, apply HORNLUX generously with a rag or lambs wool applicator. Treat an area of 100 square feet at one time. Allow HORNLUX to remain on the surface 5 to 10 minutes, then wipe off all excess with dry rags before the material becomes "tacky". Continue the application of HORNLUX over the entire area, treating 100 square feet at a time.

◆

HORNLUX is designed to completely seal the porosity of the floor, ***hence it is essential that no excess remain on the surface.*** Ordinary foot traffic will polish the hardened residue, producing a desirable sheen. If an immediate lustre is desired, the floor should be polished the following day with HORNBRITE mixed in the proportion of one quart of HORNBRITE to a three gallon pail of water. Use stiff bristle brushes in polishing.

◆

NOTE: ***Leading members of the National Terrazzo and Mosaic Association have adopted the HORNLUX treatment for Terrazzo Floors.***

◆

An Old Floor.

If a Terrazzo Floor is not properly sealed certain specific reactions occur, such as checking, pitting and powdering. The pores become filled with dirt and foreign matter as the terrazzo ages, consequently a penetrant sealer like HORNLUX will not function. Old terrazzo floors that are exceptionally dirty should be scrubbed with a solution of HORNBRITE mixed in the proportion of one part of HORNBRITE to three parts of hot water. For general cleaning and maintenance, use HORNBRITE in the proportion of ½ pint to three gallons of hot water.

◆

TO MAINTAIN

Caustic cleaners, abrasive powders, sweeping compounds or powdered soaps should be avoided. These agents cause "pitting" and weaken the bond between the marble aggregate and the surrounding cement. To eliminate "pitting", new terrazzo floors should be sealed with HORNLUX and maintained with HORNBRITE. Old floors in service will become gradually sealed through repeated cleanings with HORNBRITE. Once the surface is sealed with HORNBRITE, and has acquired its non-slippery gloss, a dry mop, brush or broom, will remove surface dust. Occasional mopping will prove effective, as pores will become filled with a preservative residue without producing a surface film.

CONCRETE

The efficiency and durability of a concrete floor surface is dependent upon the following: (1) workmanship in laying the wearing course composed of Portland cement and suitable aggregates; (2) correctly proportioning, mixing and laying; (3) proper curing. Concrete floors provide a low installation cost, are fire-proof, highly resistant to foot traffic and economical to maintain.

TO CONDITION

If surface is soft and dusting.

If the wearing surface dusts under traffic, this troublesome condition can be corrected by the application of either a chemical floor hardener or a "glazing" surface treatment.

◆

The application of HORNSTONE CRYSTALS, a chemical floor hardener, does not change the appearance of the floor. HORNSTONE CRYSTALS are mixed in the proportion of 2 pounds per gallon of water. The solution is flushed over the surface of the cement floor with a mop or broom. It penetrates the porous structure of the concrete and by a chemical reaction welds the particles of sand and cement producing a more compact, dust free, and flint-like wearing surface. A sufficient number of coats should be applied to thoroughly saturate the surface. A chemical floor hardener is not recommended for integrally colored cement floors.

◆

"Glazing" a concrete floor surface, means producing a glass-like surface over which the bristles of the sweeping brush will slide, instead of catching and flicking dust into the air. Glazing of floors which are not to be painted is accomplished with the application of HORN DUOCREX. The number of coats will be dependent upon the porosity of the concrete surface. Usually a two coat application will suffice to produce a tough, wear resistant surface. HORN DUOCREX is a transparent coating and will not materially change the natural color of the concrete floor.

◆

If oil-stained or dirty.

Sweep the surface clean. On badly stained areas, scrub with a solution of one pound of HORN D-X CLEANSER dissolved in 2 quarts of hot water to which is added a solution of equal parts of HORNBRITE and hot water. Flood the floor with this combined solution and scrub with a stiff brush or scrubbing machine. Rinse thoroughly with clear water and squeegee to remove surplus water. Repeat this operation until all oil, grease and dirt has been removed. If paint spots still remain use a paint remover; finally wash the spots with gasoline or benzine. Allow the cleaned floor to dry thoroughly.

◆

To paint.

Before applying P.D.Q. KONCREX or any other cement floor finish, be sure the floor is dry. To test a concrete floor for dryness, lay a rubber mat on the surface and allow it to remain in one position for three or four days. At the end of this time, pick up the mat and examine the under surface. If there is a slight amount of dampness in the concrete slab, it will be evidenced in the form of "sweating" on the under side of the mat. If this condition prevails, do not paint.

◆

On dry concrete floors, apply two or more coats of P.D.Q. KONCREX. For best results allow 24 hours drying time between each coat.

◆

TO FINISH AND POLISH

Concrete floors that have been dustproofed by chemical hardening or "glazing" may be further protected by the application of HORNGLAZE WAX applied in several coats with a mop or lambs wool applicator.

◆

TO MAINTAIN

Do not use scouring powders, alkali cleaners, oily compounds or soaps on concrete floors. Integrally colored floors should be treated and sealed with HORNLUX. This treatment serves to densify color and provide a more uniform appearance. After sealing, the surface should be protected and maintained with applications of HORNGLAZE WAX.

ASPHALT and MASTIC TILE

This type of flooring is composed of natural asphalt and other bitumens, asbestos fibres and pure mineral pigments. These ingredients are thoroughly amalgamated through the medium of heat and pressure, then formed into sheets and finally cut it into tile of various sizes and shapes. The tile is available in solid colors and marbleized effects. This flooring is fire resistant, resilient and affords economical maintenance.

TO CONDITION

CAUTION

This type of flooring is soluble in certain cleaners and waxes, gasoline, petroleum products and turpentine. Therefore, the treatment and maintenance of this flooring requires a careful selection of properly designed materials.

If faded, discolored or damaged.

Brush free from dirt, and scrub with HORNGLAZE CLEANER (dilute 4 to 6 parts with water). Pick up loosened dirt and suds with a damp mop. Rinse with clear water and allow to dry thoroughly. Restore the original color of the floor by mopping on the clean dry surface a coating of HORN COLORBACK. Rub gently into the surface until the coloring pigment is loosened and has had an opportunity to redistribute itself over the surface. At this point stop rubbing and use a squeegee to remove excess material from the surface. Then, damp mop with clear water and allow to dry thoroughly. If 2 applications are required, repeat this operation after the first coat is dried thoroughly. HORN COLORBACK may be applied to individual tiles or damaged areas—without treating the entire floor area.

TO FINISH AND POLISH

Where tiles are in good condition and simply require a cleaning, scrub with HORNGLAZE CLEANER (dilute 4 to 6 parts with water); mop off excess; allow to dry and apply several coats of HORNGLAZE WAX with mop or lambs wool applicator. Allow at least 15 minutes between coats.

TO MAINTAIN

For Dry Cleaning wax maintenance follow instructions appearing on Page 2. If wax coatings are not desired—occasional cleanings with a mild solution of HORNGLAZE CLEANER and buffed will protect the surface and provide a satisfactory gloss.

CORK

Cork flooring (tile and sheeting) is composed of moulded and compressed cork curlings, bound together by their sap content through a heating process. The variation of color is secured by the difference of baking temperatures to which the cork is subjected. Cork floors provide a soft resilient flooring especially adapted for libraries, museums and auditoriums where a soft, quiet floor is desired.

TO CONDITION

If coating is worn resanding of the floor is recommended. Remove the coating with a paint or varnish remover. Clean loosened varnish or shellac from the surface with a strong solution of HORNGLAZE CLEANER. Rinse the surface several times with clear water to remove any unfavorable residue left on the surface. Allow the floor to dry thoroughly. Finally wash the surface thoroughly with gasoline or benzine.

If varnished, lacquered or waxed and badly discolored.

After cleaning, to restore the color apply several coats of HORN FLORCREX with a brush or lambs wool applicator. HORN FLORCREX Clear may be mixed with HORN FLORCREX Oak Color in varying proportions to secure the desired shade.

To fill pores and harden surface.

Apply several coats of HORN FLORCREX to the dry surface, with a brush or lambs wool applicator. Rub into the surface. Wipe off any excess before the material becomes tacky. If cork is very porous, apply one coat of HORN PASTE FILLER. Follow by a 2 coat application of HORN FLORCREX. Keep area free from traffic for 8 hours to allow thorough drying.

TO FINISH AND POLISH

Build up a proper wax film with the necessary number of coats of HORNGLAZE WAX. Apply with a mop or lambs wool applicator, in a thin even film. Usually 3 to 6 coats are required for proper surface build-up.

TO MAINTAIN

The use of a stiff brush will easily keep the floor clean and glossy. This treatment is a definite protection against the loosening of cork particles and traffic wear. An occasional two-coat application of HORNGLAZE WAX is all that is required. Buffing with No. 1 steel wool under a polishing machine produces a high lustre.

MAGNESITE COMPOSITION

This type of flooring is composed of calcined magnesium oxide, magnesium chloride and a filler. It is fireproof, germ proof, resilient and economical to maintain. It is adapted for schools and public buildings.

TO CONDITION

If dirty or discolored.

Scrub with HORNBRITE (one part of HORNBRITE to three parts of hot water) using medium steel wool, stiff brush, or scrubbing machine. Squeegee the loosened dirt, and rinse the surface several times with clear water to remove any unfavorable residue left on the surface. Allow the floor to dry thoroughly.

TO SEAL

Apply HORNLUX to the dry surface (treat an area of 100 square feet at a time) with brush or lint-free rags. Allow 5 to 10 minutes for thorough penetration, and then remove all excess material on the surface with clean dry rags. Do not permit the material to become "tacky". For best results, keep traffic off the treated area for a period of 8 hours after application.

The HORNLUX treatment deepens the color and seals the pores without leaving a surface film.

TO FINISH AND POLISH

Ordinary foot traffic will polish a HORNLUX treated floor. A soft polish may be secured by buffing the HORNLUX treated area with a polishing machine or No. 1 steel wool pad. To secure a higher lustre, apply 2 or 3 coats of HORNGLAZE WAX with a mop or lambs wool applicator. Allow 15 minutes drying time between coats. Spread the wax evenly—do not rub.

TO MAINTAIN

After the HORNLUX treatment, maintain the surface by mopping from time to time with a mild solution of HORNGLAZE CLEANER. If HORNGLAZE WAX is used over this sealed surface, the wax film will offer greater protection against scratching or pitting. "Dry clean" by brushing with stiff bristle brush or broom and rewax when necessary.

MARBLE, TILE and TRAVERTINE

Marble, Tile and Travertine differ not only in color, but also in their inherent characteristics and porosity. Pure marble is white because of its high calcium carbonate content. The presence of impurities causes an endless variety of colors, veinings, mottlings and shadings. Colors and tints in marbles are due to the presence of iron oxides, organic substances, mica, etc. Maintenance methods and materials should be carefully selected for use on these floors.

TO CONDITION

If dirty and discolored.

Scrub with HORNBRITE (dilute 1 part of HORNBRITE to 3 parts of warm water), using a stiff brush, scrubbing machine or fine steel wool pad. Pick up loosened dirt and rinse with clear water. Re-scrub until all embedded surface dirt and grease is removed.

To seal, if porous.

If floor is very porous, scrub thoroughly with HORNBRITE and rinse the surface several times with clear water to remove any unfavorable residue. Allow the floor to dry thoroughly. Apply HORNLUX with rags or brush. Allow 5 to 10 minutes for complete penetration and wipe off any excess remaining on the surface with clean dry rags.

TO MAINTAIN

Scrub with HORNBRITE (1 pint to 3 gallons of warm water). HORNBRITE cleans and deposits preservative compounds in the minute pores of the marble. The floor will polish under foot traffic to a soft lustre, which is non-slippery. For subsequent cleanings, dilute HORNBRITE in the proportion of 1/2 pint of HORNBRITE or less to 3 gallons of water. If areas are used for dancing, such as grills, clubs, etc., after scrubbing up with HORNBRITE, allow to dry—then apply one coat of HORNGLAZE WAX, in a thin film with an applicator, and buff with stiff brushes or pads of No. 1 steel wool, after the wax is dry.

HORNGLAZE WAX

A liquid, self-polishing NO BUFFING-NO RUBBING (water emulsion) WAX, for linoleums, rubber, painted, varnished or unfinished wood, composition, cork, or hard type floors. Applied with a rag or lambs wool applicator; dries bright in 15 to 20 minutes. A higher lustre is easily obtained by buffing or brushing.

HORNGLAZE WAX not only seals the pores but lays a well-balanced, highly water-resistant film of protection upon the surface. Its use permits of the "dry cleaning" method of maintenance, since the hard, dry, non-slippery film prevents the embedding of dirt. HORNGLAZE WAX is elastic enough to be self-healing; will not scuff white or become brittle; neither will it remain soft and tacky.

By using stiff brushes in place of soft brooms, surfaces can be kept immaculately clean by mere sweeping, instead of daily moppings or scrubbings—a decided protection to the surfaces and a great saving in upkeep.

Approved by leading manufacturers of flooring and floor coverings. HORNGLAZE WAX WILL STAY CLEAN LONGER AND LAST LONGER.

Covering Capacity 2,000 to 4,000 sq. ft. per gallon.

HORNGLAZE WAX (Oak Color)

In addition to producing a balanced wax film the HORNGLAZE WAX (Oak Color) changes an ugly unfinished floor into a well-finished one, in one operation. Can be used on unfinished oak, maple and pine wood floors. Recommended for constant traffic areas where economy is essential, such as hospital wards, schools, stores, etc. While HORNGLAZE WAX (Oak Color) is an excellent utility product, it is preferable to seal with HORN FLORCREX and use the regular HORNGLAZE WAX, where time and expense of the more complete and durable method permits.

Covering capacity 2,000 to 4,000 sq. ft. per gallon.

HORNGLAZE CLEANER

A liquid compound especially designed to clean surfaces preparatory to receiving HORNGLAZE WAX. Ideal for cleaning floors, walls and painted woodwork. Diluted with from 1 to 15 parts of water, depending upon strength required. Added to scrubbing water usually in proportion of either 1 pint or ½ pint to ¾ bucket of water.

HORNGLAZE CLEANER not only acts as a proper cleaner, but also leaves the pores filled with a dry, hard residue which means a saving in coverage per gallon when applying subsequent wax coatings.

HORN DUOCREX

HORN DUOCREX is a perfect preservative, dust eliminator, wear resistant coating for wood and concrete floors.
HORN DUOCREX is unexcelled for treating and finishing gymnasium wood floors.

The tough surface film provides an ideal finish for school desks and seats. It is resistant to ink, scratching, marring, and not affected by body heat and perspiration.

School supervisors usually recommend a non-glare finish for desk tops. To meet this specific requirement HORN DUOCREX is available in a semi-gloss and also dull finish. (Not for floors.)

HORN DUOCREX is not affected by cleaning solutions and alkalies. It provides an excellent finish for furniture, woodwork and trim in school classrooms.

HORNBRITE

A concentrated liquid added to the scrubbing water for cleaning marble, travertine, mosaic tile, terrazzo and composition floors. The hard, dry residue deposited in the pores does not leave a surface film and permits easier cleaning after several treatments. It prevents the pitting and chipping of terrazzo and eliminates the use of harmful cleaners, such as scouring powders, alkali cleaners, sweeping compounds, oil mops, or powdered soaps.

HORNBRITE contains bleaching elements which counteract the natural tendency of terrazzo and marble to "yellow" from age and traffic.

Used in proportion of ½ pint or 1 pint to ¾ bucket of water. Use in stronger proportions for very dirty surfaces.

HORNLUX

An emulsion of phenol formaldehyde condensation products, which acts as a penetrant and a sealer for new terrazzo and new or old magnesite-composition floors.

The emulsion forms a blanket, cutting off evaporation of the solvents long enough for deep penetration of the protective elements to take place. HORNLUX is never used as a surface coating. By its pore-filling penetration it minimizes "bloom" or efflorescence, develops and deepens the true colors of the marble aggregate in terrazzo floors.

Covering Capacity: 800 to 1,000 sq. ft. per gallon.

HORN FLORCREX

A pale, amber liquid which penetrates and seals the pores of wood or dried-out linoleum. The gums, resins, and treated oils penetrate deeply. The resulting hardness checks dry rot, splintering, and preserves the original beauty of the grain and color of the wood. Oak, maple, or pine floors sealed with HORN FLORCREX and waxed with HORNGLAZE WAX eliminates further sandings, varnishing, shellacking or oiling of the finest floors in classrooms, corridors and gymnasiums.

HORN FLORCREX forms an ideal "under-surface" foundation for HORN DUOCREX treatment on gymnasium floors. Covering Capacity: 600 to 800 sq. ft. per gallon.

HORN FLORCREX (Oak Color)

Gums, resins and treated oils, in combination with a stain, which penetrates deeply into the pores of wood. In addition to acting as a filler and binder, a dark oak color is produced. The color effect may be lightened by adding clear FLORCREX, as desired, to the FLORCREX (Oak Color).

Covering Capacity: 600 to 800 sq. ft. per gal.

HORN COLORBACK

A special liquid applied to badly faded or damaged asphalt tile floors. Can be used over entire area or individual tiles. Releases a certain amount of color pigment, floating same to the surface and completely sealing the newly distributed color when dry. COLORBACK in addition to restoring the color, provides an excellent foundation for the HORNGLAZE WAX treatment.

Covering Capacity: 600 to 800 sq. ft. per gallon.

HORN D-X CLEANSER

Not an ordinary cleaning powder, but a powerful chemical compound which acts as a saponifying agent. Used in conjunction with HORNBRITE or HORNGLAZE CLEANER. D-X CLEANSER transforms oil or grease chemically into a soap, thus permitting rinsing from the surface.

One pound of D-X CLEANSER is dissolved in 2 qts. of hot water and added to a solution of ½ gallon of either HORNBRITE or HORNGLAZE CLEANER in ¾ bucket of water, when used as a powerful "booster" for the cleaning power of a solution.

HORNSTONE CRYSTALS

Chemical crystals to be dissolved in water and flushed over the concrete floor with a broom or mop. It penetrates the soft porous structure of the concrete and by a chemical reaction welds the particles of sand and cement producing a more compact, dust free and flint-like wearing surface. A sufficient number of applications are made to thoroughly saturate the surface. This treatment will not change the appearance of the floor.

Covering Capacity: 2 pounds per 100 sq. ft.

HORN P. D. Q. KONCREX

Is more than a cement floor paint. For more than twenty years it has been recognized as solving the problem of indoor cement protection.

HORN P. D. Q. KONCREX penetrates the topping, binding the surface particles together and providing a decorative long-wearing finish.

Unlike ordinary coatings, HORN P. D. Q. KONCREX is unaffected by the destructive alkaline reaction of cement. It retards the absorption of stains, oils and greases.

HORN P. D. Q. KONCREX is extremely resistant against the dusting and disintegrating action of traffic wear.

Available in a broad range of colors.

Covering Capacity: 350 to 400 sq. ft. per gallon, one coat.

A. C. HORN COMPANY 43-36 TENTH STREET LONG ISLAND CITY, N. Y.

THERE IS A HORN PRODUCT FOR EVERY MAINTENANCE, DECORATIVE and PROTECTIVE REQUIREMENT

ACOUSTICAL SURFACES
- Horn Streamlite
- Hornglaze Cleaner

BOILERS
- Hornseal
- Horn Heat Resisting Aluminum Paint
- Horn Heat Resisting Black Paint

CAMPUS BENCHES
- Hornac
- Horn R. M. Paint
- Horn Rexide

CLASS ROOMS
- Ceilings—Walls
  - Horn-O-Tone
  - Horn Commercial Flat
  - Horn Suction Sealer #300
  - Horn Pigmented Suction Sealer #400
  - Horn Super Fume Proof Undercoater
  - Horn Super Fume Proof Enamel
  - Horn Streamlite

CONCRETE FLOORS
- Horn Crete-Fix for Repairing and Resurfacing
- Hornolith (Hardening - Dustproofing)
- Painting and Maintaining (see page 5)

DAMPPROOFING
- Horn Dehydratine #1 (Bonding Coat)
- Horn Dehydratine #2-2A (Transparent)
- Horn Dehydratine #3 (Stone Backing)
- Horn Dehydratine #4 (Foundation Coat)

DESKS, BOOKCASES, CABINETS, CHAIRS, TABLES
- Horn Duocrex Gloss—Semi-Gloss—Dull Finish
- Hornglaze Cleaner
- Horn Chinawood Varnishes

DORMITORY ROOMS
- Walls and Ceilings
  - Horn-O-Tone
  - Horn Commercial Flat
  - Horn Namel
  - Horn Streamlite
  - Horn Super Fume Proof Enamel

EXTERIOR BRICK AND MASONRY SURFACES
- Dehydratines
- Horn Sanicoat
- Horn Symentrex

FENCES—WOOD AND METAL
- Wood
  - Hornac
  - Horn R. M. Paint
  - Horn Rexide
- Metal
  - Horn Galvanide
  - Horn Metal Primer
  - Horn Rexide
  - Horn Super Aluminum Paint

FIRE ESCAPES
- Horn Rexide
- Horn Galvanide
- Horn Elasticon
- Horn Super Aluminum Paint
- Horn Graphite Paints

GLAZING
- Horn Vulcatex
- Hornlastic

GREENHOUSES
- Horncaulk
- Horn Vulcatex
- Hornlastic
- Horncaulk
- Interior & Exterior White
- Horn Super Aluminum Paint

GYMNASIUMS
- Floors (see page 1)
- Walls and Ceilings
  - Horn Streamlite
  - Horn-O-Tone
  - Horn Commercial Flat
  - Horn Super Fume Proof Enamel
- Line Marking Paint
  - P. D. Q. Koncrex

KITCHENS
- Walls and Ceilings
  - Horn Super Fume Proof Undercoater
  - Horn Super Fume Proof Enamel
  - Horn Namel

LOCKER ROOMS
- Floors
  - Horn P. D. Q. Koncrex
  - Horn Concrete Floor Enamel

PIPE SYSTEMS
- Horn Industrial Enamel
- Horn Rexide
- Horn Super Aluminum Paint

RADIATORS
- Horn-O-Tone
- Horn Commercial Flat
- Horn Super Aluminum Paint
- Horn Industrial Enamel

ROOFS
- Horn Dri-N-Tite Primer
- Horn Dri-N-Tite Liquid
- Horn Dri-N-Tite Plastic
- Horn Elastex Liquid
- Horn Elastex Plastic

SHOWERS
- Concrete Floors (see page 5)
- Hornlux

STADIUM AND GRANDSTAND BLEACHERS
- Hornac
- Horn Floor Koter
- Horn Rexide
- Horn Symentrex

STAIR TREADS
- Horn Shur Tred

STACKS
- Horn Heat Resisting Black Paint
- Horn Heat Resisting Aluminum Paint

SWIMMING POOLS
- Horn Sanicoat
- Horn Symentrex
- Hornac
- Hornbrite
- Horn T. N. T. Cleaner

TOILET PARTITIONS
- Hornlux
- Horn Rexide
- Horn Industrial Enamel
- Horn Duocrex

WATER TANKS
- Horn Interior Tank Paint
- Horn Crete-Fix Grade B
- Horn Super Aluminum Paint
- Horn Galvanide
- Horn Metal Primers
- Horn Rexide

WINDOW FRAMES (Glazing and Caulking)
- Horn Vulcatex
- Hornlastic
- Horncaulk

WINDOW FRAMES (Painting)
- Hornac
- Horn R. M. Paint
- Horn Rexide
- Horn Galvanide
- Horn Metal Primers
- Horn Super Aluminum Paint

UNITED LABORATORIES
INCORPORATED

MAINTENANCE RESEARCH

Executive Offices: Euclid at Ivanhoe, Cleveland, Ohio

ASSOCIATED OFFICES IN ALL PRINCIPAL CITIES

THE maintenance of property is a specialized job and should not be delegated to one who can devote only spare time to it. There is a most confusing list of maintenance products from which to choose. There are right and wrong ways of applying them. There are annoying problems to be solved.

For eliminating maintenance guesswork, we suggest United Laboratories. A combined maintenance experience of over a century is behind us. The personnel includes individuals of widely varied experience whose composite advice and service is available to all without charge or obligation. The products recommended by United Laboratories are tested, approved and certified before being offered to our clients. You are told what they will do, what they **will not** do, how they should be properly applied and how you can get the longest service from them. You are never asked to experiment at your expense.

Maintenance problems and their solution is our life work. We serve more than 50,000 clients through our 150 Field Associates who operate from our 16 Associated Offices.

PLASTIC ROCK

"Your Old Floor on Saturday Is a New Floor on Monday"

Plastic Rock comes to you in complete units. Each ingredient is sealed in its own container in proper proportion. Add water on the job and you have a mastic of the consistency of mortar. This mastic is spread from ¼" to ½" deep over your rough, worn, broken or cracked concrete or wood floors. It is troweled to a smooth finish and allowed to dry. Is used for patching as well as complete floor covering.

When dry, Plastic Rock is flexible, dustless, waterproof and as silent as rubber-soled shoes. It deadens sound, cannot splinter, crack, curl or loosen from the base. **It is absolutely fire retardent** because it is composed of inert materials.

Hundreds of schools and colleges have eliminated the expense of removing old floors in corridors, halls, wash rooms and locker rooms by installing Plastic Rock. It is 100% skid-proof, wet or dry.

Investigate Plastic Rock before you decide to rip up your worn-out floors.

STAIR TREADS: Worn stair treads and landings can be beautifully surfaced with Plastic Rock in a few hours' time. Absolutely non-slip.

Plastic Rock Units are shipped complete. Simply add water and mix

The Plastic Rock mixture is spread and then troweled to a smooth finish

The resulting surface is quiet, flexible, sanitary, slip-proof and easily cleaned

A COMPLETE MAINTENANCE SERVICE

More than a century of maintenance experience is at your command. We specialize in roofs, floors, waterproofing, caulking and special service paints and varnishes. We offer a most economical method of waterproofing concrete grand stands. We offer a non-burning, easily-applied mopping varnish for gym floors. Tennis court and play-ground resurfacing may be done by your own crew or a contractor under our supervision. Plastic Rock, explained above, is one of more than 100 products recommended by United Laboratories, Inc.

SECTION V
LANDSCAPE DESIGN AND DEVELOPMENT

LANDSCAPE ARCHITECTURE FOR THE GROUNDS OF EDUCATIONAL CENTERS

By HARRY WHITCOMB SHEPHERD

Associate Professor of Landscape Design, University of California;
Member, American Society of Landscape Architects

THE landscape architect is not in a position to render his most effective service unless the problems of site selection and location of structures are given careful consideration while the educational center is still at the planning stage. There are obvious drawbacks, therefore, to the usual practice of calling a landscape architect into consultation following completion of the building program. This tendency, however, is only one indication of a rather general failure to understand the nature of landscape architecture and the functions of the landscape architect. Landscape development should not be considered as a last-minute trimming, but as an integral part of the entire program of providing for a satisfactory educational center. The following outline gives practical information for the assistance of Regents, Boards of Education and other educational administrators anxious to secure adequate landscape architectural service.

Questions to be Settled Prior to Building or Landscaping

I. What is landscape architecture?

Landscape architecture is an art which concerns the arrangement of land surface and the elements thereon so as to create a beautiful composition for use and enjoyment.

II. How much money should be allotted to landscape development?

(a) At least 5 to 10 per cent of the total expended for land and buildings exclusive of equipment and furnishings.

Example: Building and land—$50,000.
Landscape development—$5,000.

III. What is the approximate cost of landscape architectural service?

(a) Ten per cent of the total cost for landscape development, with additional expense for traveling.

Example: As above—10 per cent of $5,000, or $500.

IV. What constitutes a qualified landscape architect?

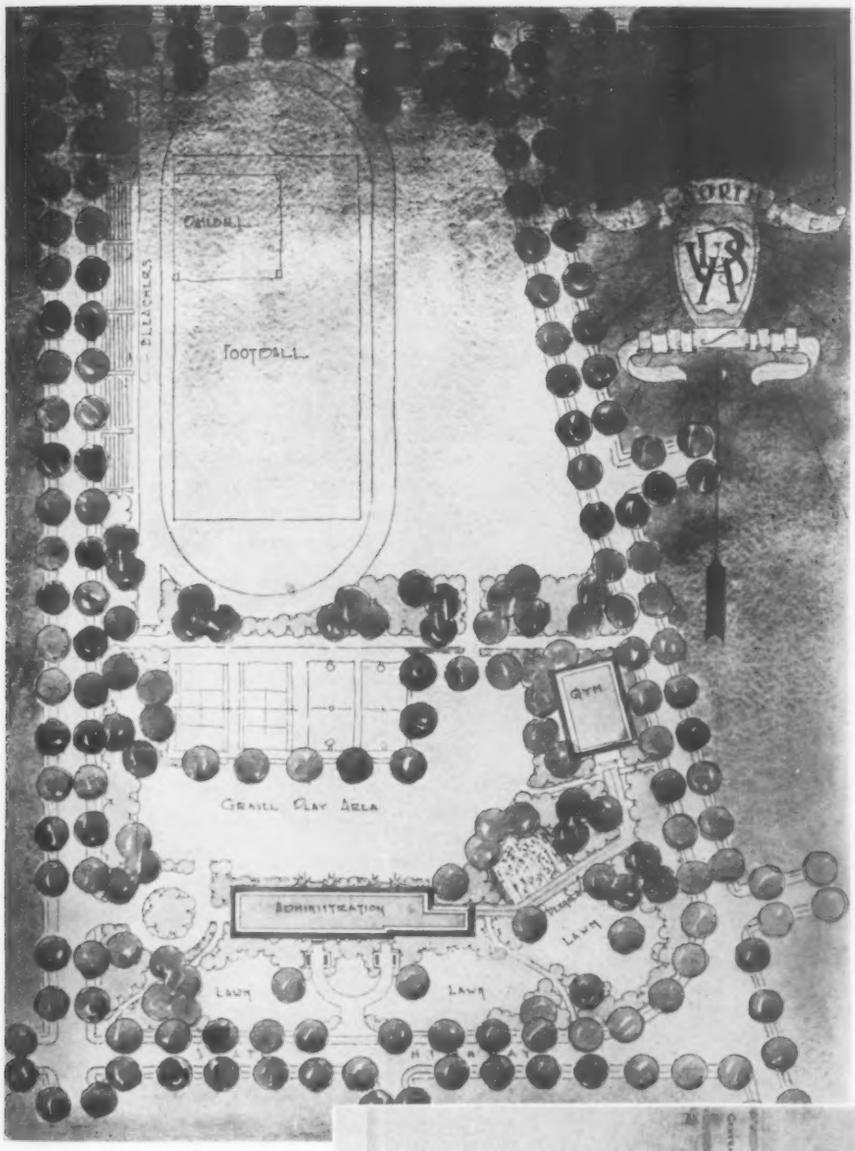
A qualified landscape architect is one educated and trained in the profession of landscape architecture and recognized for his successful experience and accomplishment by membership in the American Society of Landscape Architects, a national organization.

V. When should a qualified landscape architect be retained?

The educational administration will find it advantageous to retain a landscape architect at the same time that an architect is being retained, so that, together with the business manager or administrator, they may consider the problem of choice of site, location of structures, and other factors important in establishing an educational center. If a landscape architect is called into consultation before the site is selected, there will be an analysis of the problem to determine the topographic and physical possibilities of development to comply with the requirements. The requirements may be extended in anticipation of an enlarged program, so that the greater facilities may be realized when needed.

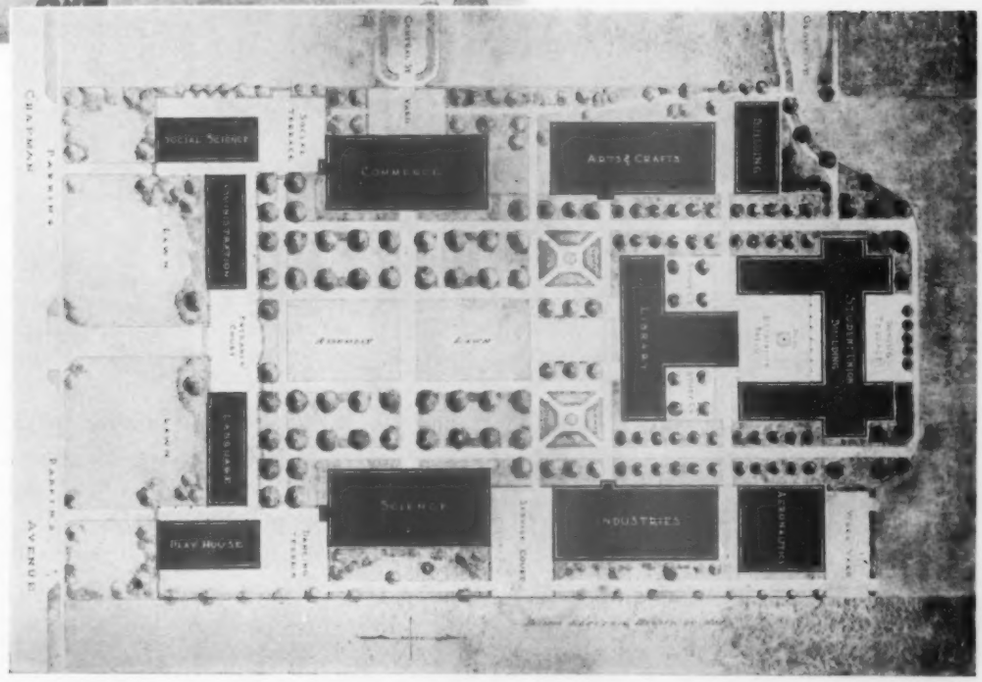
VI. For what period should a landscape architect be employed?

Planning and supervision during the period of landscape development, which may not be less than one year, and usually not more than two years.



Development is implied in planning

The preliminary study for the Davis Joint Union High School (H. W. Shepherd, landscape architect), shows provision for building expansion and relationship to the athletic program



Preliminary general plan of Fullerton (Calif.) District Junior College as developed by Harry K. Vaughan, architect, and Ralph D. Cornell, landscape architect

A carefully thought-out plan is the first essential to economic design

VII. How may payment for landscape service be arranged?

Monthly stipends over a two-year period.

VIII. What factors should be considered in site selection?

1. Topography—elevated for satisfactory drainage and level.
2. Size—at least 20 to 40 acres.
3. Shape—square or slightly oblong.
4. Soil—well-drained loam of good agricultural quality.
5. Outlook.
6. Natural protection from strong prevailing winds.
7. Satisfactory access by roads and public utilities.
8. High amenity—protection by adequate zoning restrictions against those industrial or commercial developments which may noticeably lower the values essential to educational ground development.
9. If on a primary or secondary highway, protection by freeway.
10. Water supply.

IX. What is the order of activities in landscape development?

1. During the first year:
   (a) Grading.
   (b) Drives, walks.
   (c) Parking and service areas prepared for use.
   (d) Irrigation system installed, with exception of distributing units for lawns.
2. Second-year activities:
   (a) Preparation of soil during late spring and summer for planting.
   (b) Cultivation of soil during summer to eradicate noxious weeds.
   (c) Sowing of grass seed during fall.
   (d) Planting of trees, shrubs and herbaceous material during fall and following spring, as conditions permit.

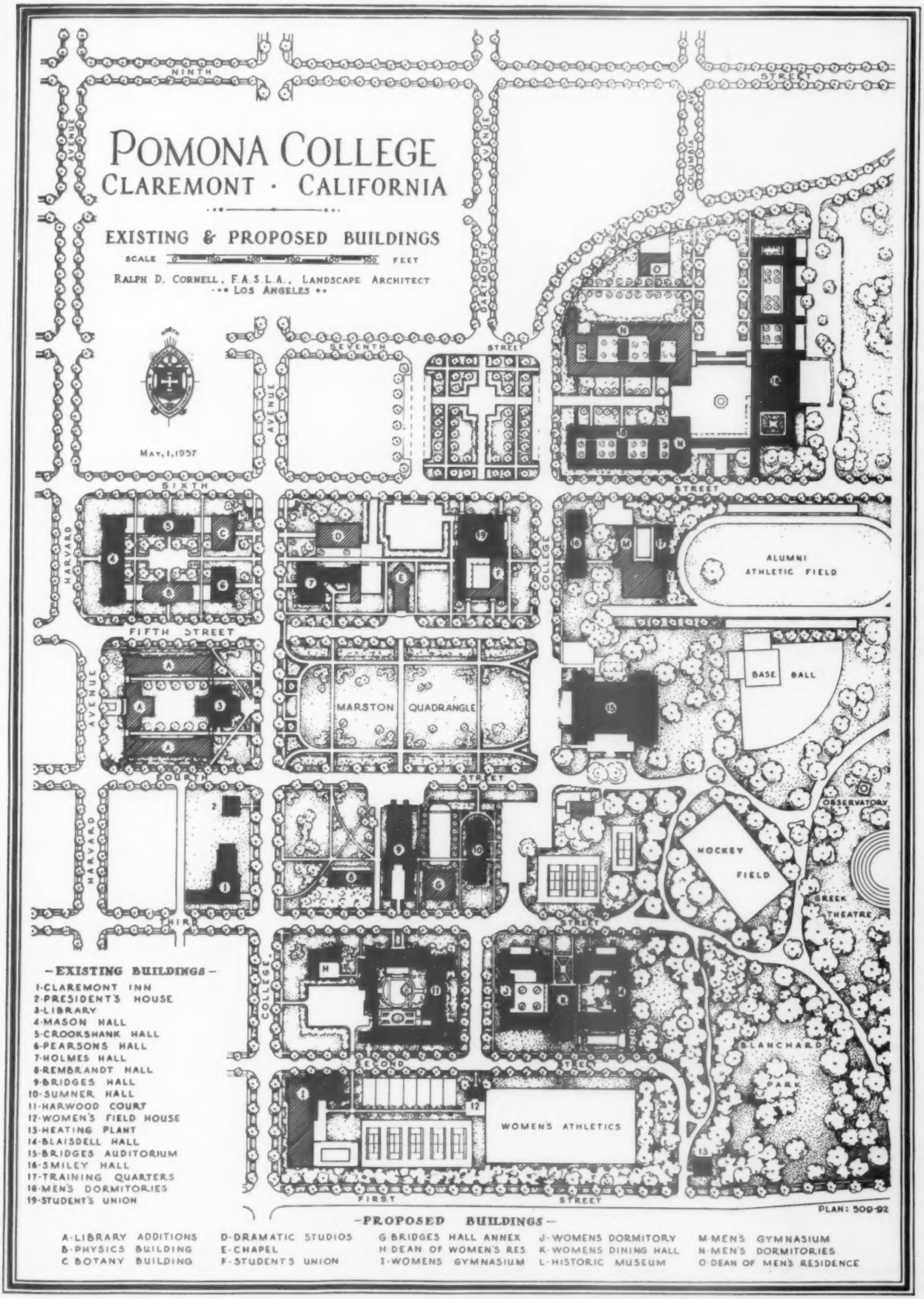
X. What is the function of a landscape architect?

(a) He will cooperate with the architect in the location of the buildings if retained early in the construction program.
(b) He will collaborate with the architect in developing a *general* or *master* plan.
(c) He will submit for approval the following separate plans for the permanent record of work:
   1. Grading plan, showing drives, walks and playing fields.
   2. Irrigation plan, showing location of mains, laterals, control valves and distributing equipment.
   3. Planting plan, showing location of all trees, shrubs, vines and herbaceous material.
(d) He will submit the following reports:
   1. General or master plan report.
   2. Report including specifications and estimates of grading, drives, walks and playing fields.
   3. Report including specifications and estimates for irrigation system. If well water is to be used, an analysis of the water is necessary to prevent the use of water high in salt content. The development of municipal systems has considerably simplified this problem.
   4. Report including specifications and estimates for planting.
   5. Report including recommendations and directions for subsequent care of trees, shrubs, lawns and herbaceous material.
(e) He will render the following services:
   1. Frequent supervision of the site during construction, in order to determine natural drainage, adequate access and circulation, traffic control for safety, protection of areas to be planted, and essential parking facilities.
   2. Contractor's specifications, to include provision for restricting building operations to planned areas for drives, walks, parking and service areas, for the prevention of soil puddling during season of rainfall in areas reserved for planting.
   3. Regulations to be included in contractor's specifications to prevent disposal of débris within areas for planting, to provide for clearing ground of all contractor materials by a stated time following completion of construction, and to assure a satisfactory disposal of sub-soil.
   4. Coordination of equipment use may be planned, and thereby enable a saving in grading and preparation of planned areas. Equipment for excavation for building may be continued in use for grading of playing fields and other areas. Selection of surface soil at time of excavation, and preservation for use in conveniently located stock piles.
   5. In anticipation of various needs for the units of the landscape development, an extended period enables the landscape architect to investigate sources of equipment and plant material and thereby provide for the most thoughtful selection.
   6. Determination of satisfactory sequence of activities.

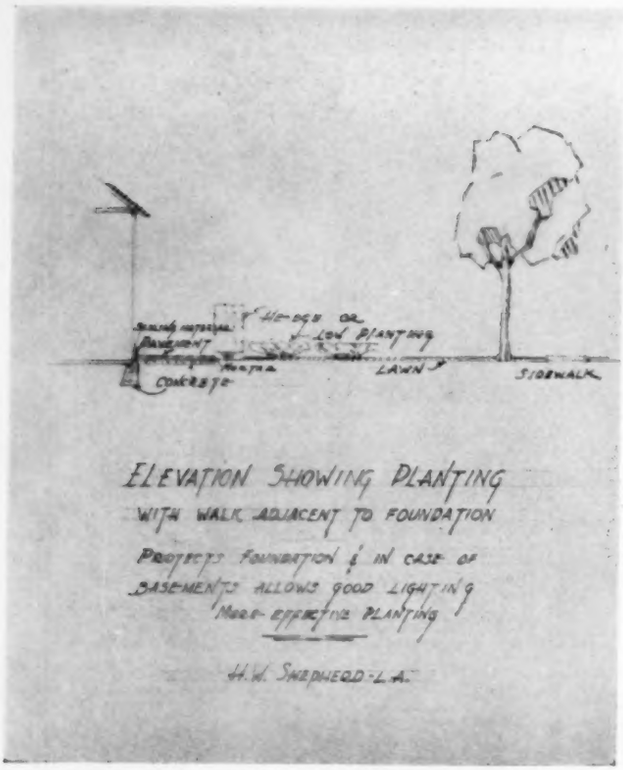
      Example: (a) Need of windbreak for playing field, necessitating early development of temporary water system to hasten growth of windbreak trees.
      (b) Early installation of irrigation system to provide for proper settling of ditches and summer eradication of noxious weeds.

Planning Driveways and Walks

Drives and walks should be located where they may be used, and so that they connect two points economically. Frequently a paved area, shaded by umbrageous trees strategically located, is most effective. Pavement may seem most expensive if well constructed, but eventually may prove economical and most favorable relative to appearance.



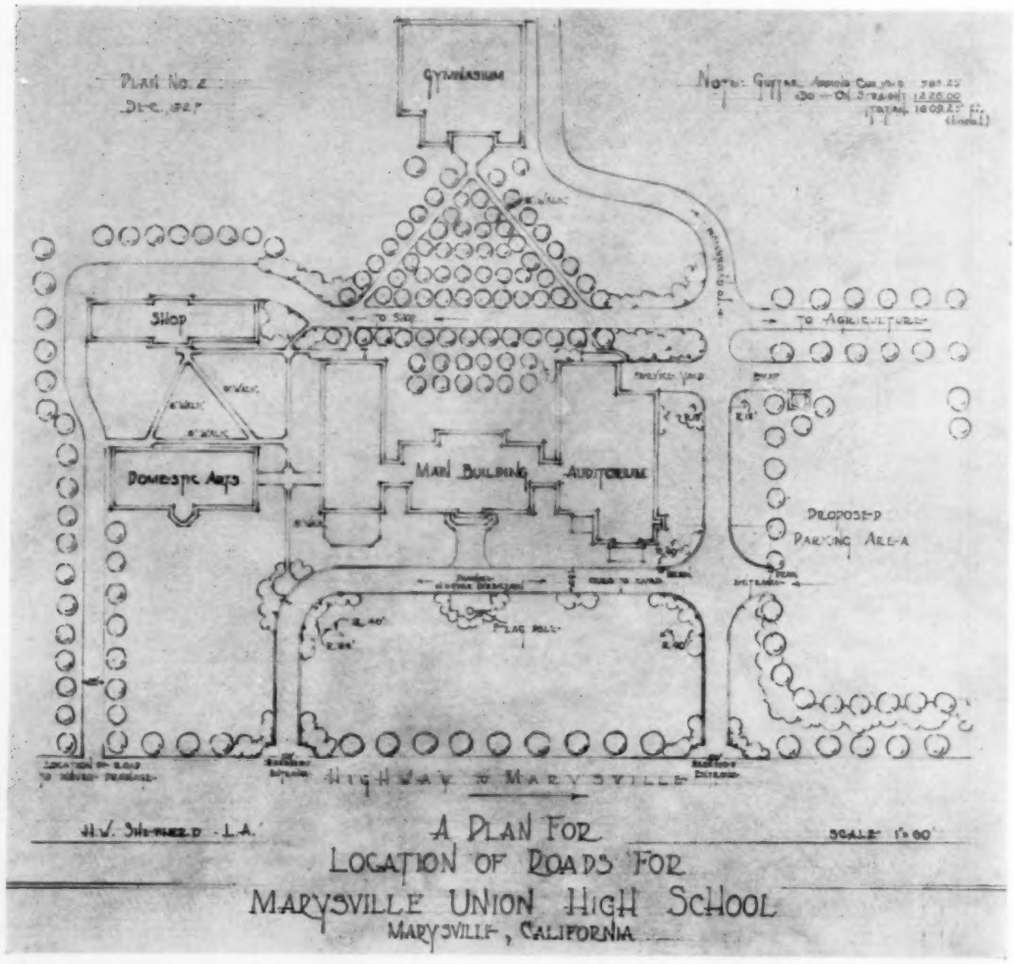
The development plan of a college campus. In this case the landscape architect has served as consultant for nineteen years



Showing location of walk at foundation, enabling a different and more satisfactory treatment of planting near structure. Protection at the foundation as well as better care of plantings is realized by this type of planning

Drives and walks should be of durable material, and service drives should be constructed to support heavy traffic. Directness should be the chief rule to follow in walk and drive location. "Horse and buggy" standards of drive as well as walk construction have prevented progress in use of these facilities. Usually in many schools drives have been too narrow and walks too wide. There is a definite relationship of building to grounds, and this should determine these factors in design. Planting of large trees will correct the scale when drives or walks seem too wide.

From the illustration it will be noted that a walk at the foundation may serve for pedestrian traffic and for protection of a well-constructed foundation. The early writers on planting composition frequently advised "tying" a building to the ground by massing foundation planting against a building. Ugliness in construction probably justified the treatment; however, today, with attractive architecture by eminent architects, it seems absurd that this rule should still be followed. The advantage of a walk which extends the foundation is readily realized and provides light for basement rooms and better protection from drainage waters. Plantings are also better cared for when



Among the number of special plans, a walk and drive location plan is essential

Complete specifications may be determined only from well-considered plans which meet the requirements of the educational program

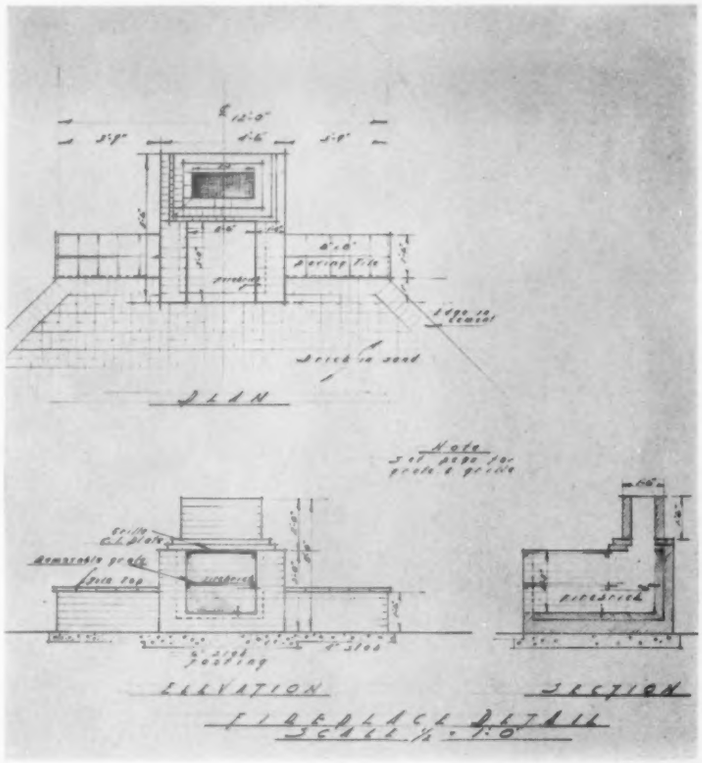
not placed against the foundation, since they are more accessible.

Planning "Educational Centers"

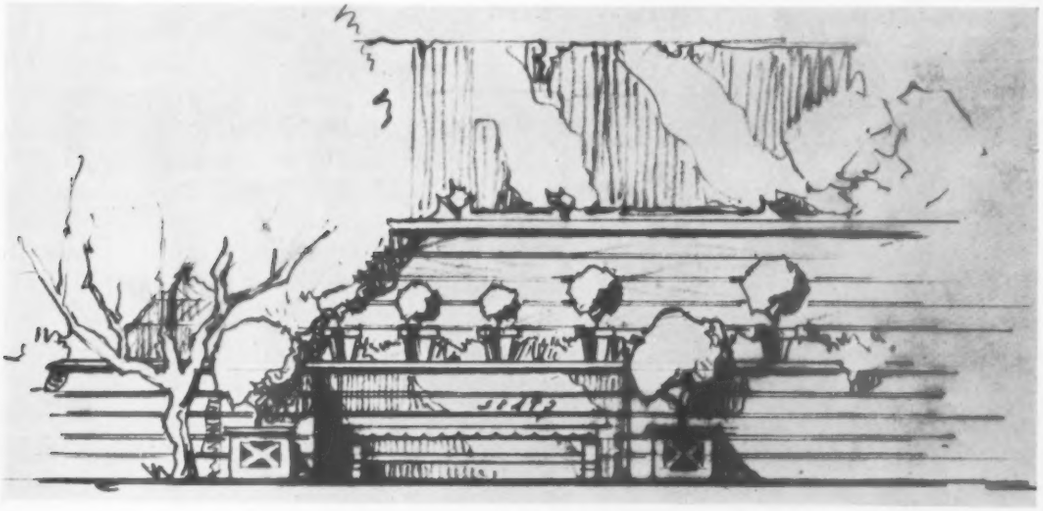
Certain features which develop intimacy and interest in public grounds have been lacking in the past, especially in high schools and higher institutions of learning. However, as the junior college and high school are tending to become community centers, there should be woven into the environment useful symbols of culture, as, for example, ornamental fireplaces, bird fonts, pools and fountains, sun-dials, garden benches, and pergolas. These need not be expensive, and may be designed and even constructed by the departments of the institution.

Plant Composition

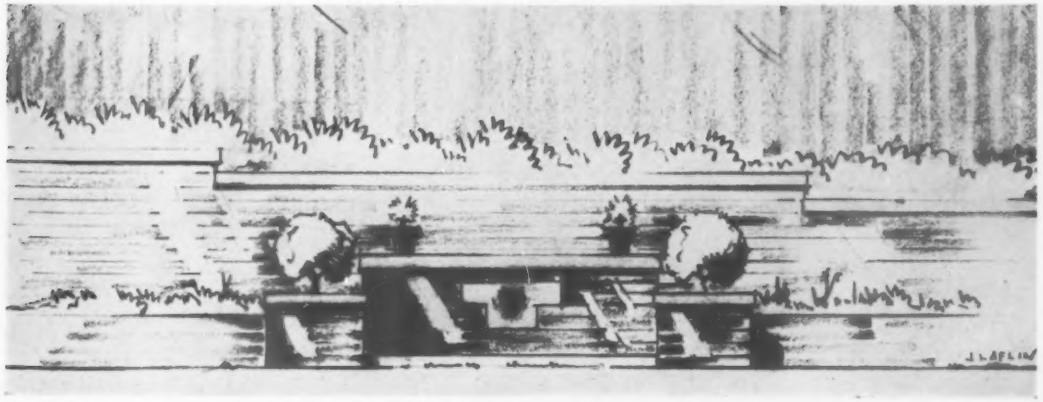
Unity in composition is not realized by the selection of a tree and a shrub of each species and spotting these over the foreground lawn of a public building. Too frequently, grounds of beautifully planned public buildings are left to a



Suggested design for an outdoor fireplace which might be built in the educational center as a project in domestic science

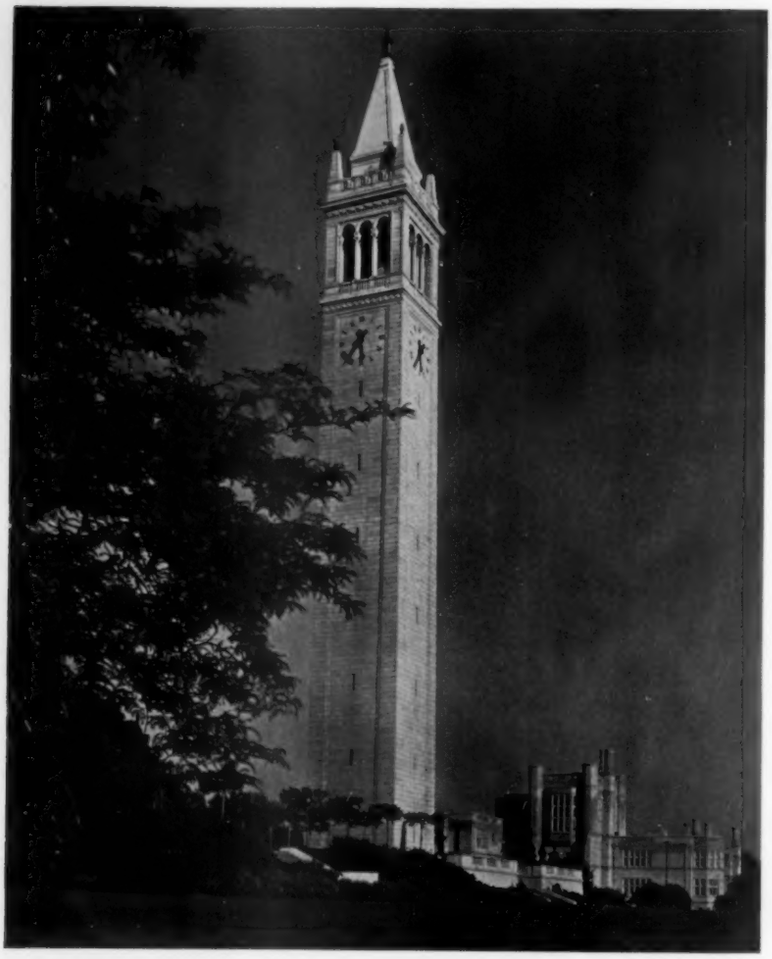


A wooden bench featured by planting. This would be appropriate for a protected court as part of an educational center



An example of a wall fountain which may be adapted as a feature for an educational center. School and college grounds should have more features which develop a feeling of interest, atmosphere and intimacy in design

Fireplace, bench, and wall, above, designed by H. W. Shepherd



Esplanade, Campanile and Stephens Union at the University of California (John Galen Howard, architect; John W. Gregg, landscape architect)

horticulturalist who is called a landscape gardener. A gardener may be primarily interested in plants and give little attention to harmony of mass composition, and ecological factors such as adaptation to climate and soil, relationship of form of plant to architectural structure, vista framing or skyline effects, and the value of an unobstructed lawn for the registration of pleasing shadows. Planting should follow the established plantation of the district. Too much variety destroys simplicity and also prevents the pictorial composition which may be accomplished by a mass of one variety of shrub and a fine tree. Good architecture should never be "smothered" with foliage. This smothered effect is usually produced by neglect. Shrubs should be selected according to climatic and soil adaptation, and usually with preference for the rich dark greens. Greens are always restful and serve best for most favorable background for perennial or annual color.

Trees are the chief elements in planting design, for they are the most conspicuous. Tree costs will be the least, for the majority of plants will necessarily be shrubs. Strong, effective trees are pleasing elements in any landscape—how beautiful is a straight road framed by stately Lombardy poplars! It is not meant that all straight roads should be lined with poplars, for in many places the enemies of these trees are too numerous for successful growth. The Liquidambar, tulip tree, beech, plane tree, sugar maple, pin oak, black oak, pistachio, and maiden-hair tree are a few fine trees which are excellent for avenue or background effects. Though the short-lived, quick-growing poplar has been mentioned with admiration, it is usually best to plant the long-lived and more slowly growing trees on college and school grounds.

Vines are usually neglected and are therefore not considered for public buildings, but there is a factor in their use which is often underestimated—the economy of space. Vines do not require much ground space. When controlled in their tracery effects for foliage shelter for arbors, pergolas and screens for supports, and fences, no other planting will take their place. Hardy vines free from pests and disease should be planted, and these are few indeed. The ornamental quality of the leaf is more essential than fleeting color. The grape-leaf shape is always ornamental, and Virginia creeper, Boston or Japanese ivy, English ivy, and, where conditions permit, the American as well as the European grape, are all desirable.

Annual and Perennial Plantings

Annuals and perennials for sub-shrub cover and spring color effects are very desirable. On one college campus the grounds superintendent advised against the planting of annuals and perennials owing to the assumption that the boarding houses and clubs would decorate with these blooms. A trial was authorized, and this herbaceous border became so successful that later annual appropriations were made to provide for annuals and perennials along certain walks and drives. Hardy annuals, bulbs and perennials were used, and the colorful corners and borders became features during spring and fall. Annuals which re-seed and perennials which may be divided are best for mass color effects. Throughout the West where rodent damage is likely, only such bulbs as daffodils should be used. Iris is another bulbous plant which certainly is well adapted in many places for spring mass or border effects.

Lawns

Where satisfactory conditions provide, a well-established lawn is necessary for the developed college or

school grounds. No other element in the planned landscape replaces a well-maintained lawn. For most places simple rules govern good lawn construction. The soil should be of a character which will produce good vegetables; a gritty loam of dark color and including considerable organic matter to 8 inches in depth will produce good grass. Slopes and air drainage are essential. By air drainage is meant—having no pockets where cross-circulation of air is impossible. Tree and shrubbery groups may be located to provide for this cross-current of air. Seed should be of one variety, as an all blue grass lawn, an all Astoria bent lawn, or an all Chewings fescue lawn. No mixtures except for shaded areas should be used, and for such areas an equal blend of Kentucky blue grass and rough stalk meadow will prove most satisfactory.

Soil preparation for lawns is usually neglected. This should receive the most careful consideration. Soils are best handled when dry, and therefore during periods of low rainfall or the dry season, and for this reason all handling of soil should be scheduled. Organic matter in the form of barnyard or other manure should be mixed with the soil during early summer to provide ample time for the eradication of annual weeds during the growing season. For most situations in the West, fall sowing is best, and rates of sowing should not exceed 1 pound per 300 square feet, for Kentucky blue grass, and 1 pound per 500 square feet for Astoria bent, especially if the seed is viable, re-cleaned and high in germination. It is best to lightly cover the seed with a pure sand mulch rather than peat to prevent disease such as brown patch. Good lawns need frequent applications of bone meal, a complete organic fertilizer, or commercial fertilizer prepared for lawn application. Applications of bone meal every fall at the rate of 25 pounds per 1,000 square feet, and during growing season not over 10 pounds per 1,000 square feet for a commercial or concentrated organic fertilizer every six to eight weeks, will maintain a thick weedless sod, provided the sod has been started weedless. During the summer, water may be withheld for the benefit of the lawn as well as the soil for a period of three weeks to one month. Later, when water is applied, the surface may be perforated by a spiking tool manually or machine operated. Following this spiking, the bone meal may be applied.

During the growing season, weekly cutting will be found essential, and the most satisfactory length for cutting has been observed to be 1½ inches for best appearance and growth.

Maintenance and Development

Changes from an approved plan are necessary from time to time, and planting adjustments necessitate the maintenance of scale in composition and satisfactory upkeep. There should be provision in all educational centers for continuous landscape architectural consultation service at a reasonable stipend. Landscape architects are always zealous to maintain their compositions in the most favorable appearance. In many universities and colleges the landscape design department fulfills this function. In secondary schools and junior colleges where landscape departments are not established, expenditures for landscape architectural consultation service may be justified in the high values created and maintained, which may ultimately be reflected in adjacent property.

Bridges Hall at Pomona College shows balance in framing with Italian cypress, clipped accents of boxleaf, and myrtle and luxuriant vines. The spacious walks are neatly edged. (Myron Hunt, architect; Ralph D. Cornell, landscape architect)

THE MAINTENANCE OF UNIVERSITY GROUNDS

By WAYNE H. LAVERTY

Resident Landscape Architect, University of Chicago

GOOD organization in a university or college grounds maintenance group is particularly important because of diversification of functions and the large area to be maintained.

The landscape architect should head this group. Whether he is resident or consultant depends a great deal on local conditions. The ideal supervising arrangement would be to have a consulting landscape architect on a retainer basis. He would acquire ideas from his other contacts and might in many cases be the one person with a continuing interest in the grounds. Since a landscape result is acquired only after years of concerted effort, one person with continuing interest is an important factor in developing well-landscaped grounds. The landscape architect's duties should be to make plans for new work, see that they are properly carried out, and assist the institution in maintaining its grounds at the least possible cost.

Costs

The actual cost of maintaining university and college grounds is an exceedingly variable figure. Where labor prices are high and growing conditions are poor, a fairly good standard can be maintained for approximately one cent per square foot per year. In rural areas where minimum labor costs prevail and available soil is suitable, this cost should not exceed one-half cent. Condition of soil, labor cost, general growing conditions and the standard of maintenance desired are all variables in the elements of cost.

The type of landscape design will also influence cost of maintenance. Informal planting and arrangement will cost less than a formal plan. There will be few hedges to trim or straight lines to retain, and when an occasional weed is allowed to grow or the grass left long, the disturbance will be less noticeable. A certain excellent informal planting had very little care for approximately fifteen years. Five years ago, fertilizing, composting and intelligent pruning and spraying were started. Now the plants are again in good condition, and the whole composition is a beautiful example of landscape gardening. For years of good appearance at low maintenance cost, the informal arrangement should be followed. In small courts, at entrances and in connection with small memorials, a formal treatment can be employed.

The elements which enter into well-maintained grounds at minimum cost are: good organization and supervision; adequate equipment and materials; and sensible planning. It would seem that the first is most important. Given intelligent supervision, the rest will follow. There are more misbeliefs, wrong practices and misplaced effort in gardening than in almost any other work. Good supervision and intelligent workers will assure a minimum of these errors. Buying ineffective fertilizers, wasting compost material, cutting grass improperly, and using uneconomical equipment, are a few phases of grounds work where good supervision will produce savings.

Suggested Organization of Grounds Crews

A well-trained gardener should be employed full time. He will do propagating, supervise the planting, and expedite all routine care of the grounds. The actual work of cultivating, planting and general care of the grounds may be done by laborers who have a love for plants. It is well to employ as many men with gardening experience as possible.

The grounds can be divided into sections of about twelve acres each, with one man as caretaker. He should be held responsible for the strictly routine care, such as cultivation, watering trees and shrubs, fertilizing shrubs, some weeding, reseeding small areas, keeping the grounds clean and neat. He should also report any unusual condition which he cannot handle, such as insect infestation and large weed areas. He may occasionally need the help of an extra man during the summer months.

Operations such as tree fertilizing and care, insect control, grass cutting, fertilizing and watering during long dry spells, extensive weeding programs, and walk and fence care, can best be handled by special crews. These crews should be composed of men who are especially adapted to each class of work. A possible organization of some of these crews may be as follows:

Tree Care.—If there are many large trees, two men should be assigned to this job for most of the year. They should fertilize, spray and trim the trees and do any surgery work which may be necessary. These men must be good climbers.

Grass Cutting.—One man with a power machine and

Examples of the informal landscape at the University of Chicago

two trimmers make a good crew. The power machine should cut at least five feet in order to keep the trimmers busy.

Grass Fertilizers.—A crew of four or five men should be employed. The best time is early in the spring before the grass becomes green, or late in the summer when the grass is dry. Grass fertilizer should be high in nitrogen.

Watering Grass When Very Dry.—The best time for this work is at night. Two good men can cover from 30 to 35 acres if there are plenty of conveniently located water outlets.

Extensive Weed Killing.—Two men should be assigned to this job for the summer. Chemicals are available which are fairly effective; some are used as spray, others are injected with a patented gun. Use of these materials is still in an experimental stage, but should provide substantial savings in labor.

Walks, Roads and Fences.—One handy man can be trained to construct, repair and observe the condition of these adjuncts. When necessary, he can be given help to keep them in good repair.

All these operations should be placed under the direct supervision of the head groundsman or gardener. It is a good policy to provide as many year-round jobs as possible. One way to accomplish this is to retain a small crew, using them for the actual work in the winter and as supervisors during the summer.

Equipment and Materials

Grass-cutting equipment becomes larger as the size of clear, open spaces increases. For the average small campus of 15 to 20 acres, the 30- to 32-inch cut power mower with trailer units is suitable. For the larger campus where play areas or fields divided by roads, curbs and walks are to be cut, any of the regular golf tractors with three hoist-raised cutting units will show a saving. On extensive areas without curbs and walks to cross, the gang mowers of five or seven units may prove useful. These golf tractors can be used to power a snow-broom in the winter, to cut weeds with a sickle attachment, and haul loads of dirt and other materials.

Hand mowers should be simple in design and should cost not more than $10 to $15. The $30 mower under heavy use will not last more than three years and will probably require repair during the third year. The cheaper mower, if a good one, will last one-and-a-half or two years and require no repairs during that period.

Cut grass long—not less than 1¾ inches. This is an important rule in maintaining good turf. Short cutting weakens the grass, just as a tree would be weakened if most of the leaves were constantly removed.

Grass seed must be of good quality and clean. Most of the grass seed mixtures sold in the market are made up of at least half dirt, chaff, and undesirable grasses. Grasses should be bought individually, tested and mixed. The type of mixture depends on the location and growing conditions. In the Middle West, blue grass is our most widely distributed ground cover. In this region, it would be well to include a high percentage of blue grass in the mixture. About three per cent of Dutch white clover in the mixture provides a good nurse crop and helps to improve the soil.

Insect-control equipment must be of varied size and capacity. One or two small shoulder spray tanks are useful for less serious infestations. A powered gun with a 200- to 300-gallon tank is necessary for winter spray and controlling caterpillars on vines and trees. This powered spray gun can be used to fertilize trees by using an attachment similar to that recommended by the Missouri Botanical Gardens.

Snow removal is a task which will be a great source of worry unless properly handled. One good snow-plow, the width of the walks and powered by a 1½-ton truck, will plow any snowfall as far north as Chicago. A snow-broom attached to a light tractor with pneumatic-tired wheels can be used on walks other than concrete.

The secret of snow removal is to start working when the depth is not more than 4 to 6 inches. It is well to have some system of call whereby the key men are notified when they should start work. When equipment is operating correctly, only a few men will be required to clean approach walks and steps to the buildings.

A golf tractor with three hoist-raised cutting units

LANDSCAPE ARCHITECTS FOR UNIVERSITY AND SCHOOL PROJECTS

The following directory is restricted to Landscape Architects who are in independent professional practice and have actually been identified with a number of university or school projects.

Space limitations permit only three listings for each individual or firm, and preclude mentioning either the name of the architect associated or the definite character of the work undertaken for each institution. It is believed that the majority of landscape architects specializing in school and university work are here represented, and that many of the projects listed have had a considerable influence on high-grade professional practice in the planning and planting of school grounds and college campuses throughout the United States.

CALIFORNIA

Ralph D. Cornell, 3723 Wilshire Blvd., Los Angeles
Pomona College, Claremont
University of California at Los Angeles
Fullerton District Junior College, Fullerton

Howard E. Gilkey, 3147 Sheffield Ave., Oakland
Mills College, Oakland
Saint Mary's College, Moraga
Modesto Junior College, Modesto

John William Gregg, University of California, Berkeley
Campus development for the University of California at Berkeley, Los Angeles, Riverside, Davis, La Jolla and U. C. Hospital, San Francisco

H. W. Shepherd, 821 Shattuck Ave., Berkeley
Union High School and Junior College, Marysville
Branch College of Agriculture, Davis
Round Valley Union High School, Covelo

Butler S. Sturtevant, 210 Post St., San Francisco (also in Seattle, Wash.)
University of Washington, Seattle
Principia College, Elsah, Ill.
Principia School, St. Louis, Mo.

COLORADO

S. R. DeBoer, 515 E. Iliff Ave., Denver
Regis College, Denver
Boulder High School, Boulder
Wyoming State Training School, Lander

CONNECTICUT

Thomas H. Desmond & Associates, Inc., Box 208, Simsbury
U. S. Coast Guard Academy, New London
Connecticut State College, Storrs
Robert E. Fitch High School, Groton

Joseph F. Whitney, Middlesex Rd., Darien
Engineering Court, University of Cincinnati, Ohio
School Group, Falmouth, Mass.
Grade and High School, South Dennis, Mass.

DISTRICT OF COLUMBIA

Joseph C. Gardner, 1700 I St., N.W., Washington
Woodrow Wilson High School, Washington
Eckington School & Recreation Center, Washington
Bennings School & Recreation Center, Washington

FLORIDA

Frank M. Button, 913 Avenue Majorca, Coral Gables
University of Vermont, Burlington, Vt.
Ponce de Leon High School, Coral Gables
Millikin University, Decatur, Ill. (Partner of Simonds Co.)

Herbert L. Flint, Post Office Bldg., Winter Park
Mount Union College, Alliance, Ohio
Newport School, Ironwood, Mich.
Rollins College, Winter Park

ILLINOIS

Jacob L. Crane, Jr., Wrigley Bldg., Chicago
Lawrence College, Appleton, Wis.
High School, Ponca City, Okla.
Chicago Board of Education (64 schools)

Chance S. Hill, 1333 Maple Ave., Downers Grove
North Central College, Naperville
Northern Illinois State Teachers College, DeKalb
Main Township High School, Des Plaines

F. A. Cushing Smith & Associates, 431 Central Ave., Wilmette
St. Agnes School, Albany, N. Y.
Rockford College, Rockford
Medical and Dental College, University of Illinois, Chicago

INDIANA

Donald B. Johnston, Architects and Builders Bldg., Indianapolis
Miami University, Oxford, Ohio
School, Richmond
Earlham College, Richmond

Lawrence V. Sheridan, Brendonwood, Indianapolis
Purdue University, Lafayette
St. Mary of the Woods Academy, Terre Haute
Shortridge High School, Indianapolis

MARYLAND

Irving W. Payne, 4017 Leland St., Chevy Chase
Georgetown Preparatory School, Garrett Park
The Miss Madeira School for Girls, Greenway, Va.
Lanham Grade School, Lanham

MASSACHUSETTS

Robert Washburn Beal, 185 Devonshire St., Boston
Eldon Keith Field, High School, Brockton
Bowdoin College, Bowdoin Athletic Field, Brunswick, Maine
High School Campus and Athletic Field, Whitman

Franklin Brett, Duxbury
Marshfield High School, Marshfield
Weston High School, Weston
Duxbury High School, Duxbury

Laurence S. Caldwell, 45 Bromfield St., Boston
Vassar College, Poughkeepsie, N. Y.
Bates College, Lewiston, Maine
Belmont High School, Belmont

Herbert J. Kellaway, 12 West St., Boston
Andover Newton Theological School, Newton Center
Middlebury College, Middlebury, Vt.
Oak Hill School, Newton

Warren H. Manning Associates, 1430 Massachusetts Avenue, Cambridge
Virginia Polytechnic Institute, Blacksburg
Phineas Lawrence School, Waltham
Yarmouth School, Yarmouth

John Nolen, Harvard Square, Cambridge
Babson Institute, Wellesley
Queens College, Charlotte, N. C.
University of Wisconsin, Madison, Wis.

Olmsted Brothers, 99 Warren St., Brookline
Phillips Academy, Andover
Denison University, Granville, Ohio
Duke University, Durham, N. C.

Bremer Whidden Pond, 5 Boylston St., Cambridge
University of New Hampshire, Durham, N. H.
Southern Methodist University, Dallas, Texas
Radcliffe College, Cambridge

William H. Punchard, 11 Harding Ave., Belmont
Woburn High School Athletic Field, Woburn
Middlebury College, Middlebury, Vt.
Abbot Academy, Andover

Arthur A. Shurcliff, 11 Beacon St., Boston
Wellesley College, Wellesley
William and Mary College, Williamsburg, Va.
Groton School, Groton

Frank A. Waugh, Amherst
Massachusetts State College, Amherst
Kansas State Agricultural College, Manhattan, Kans.
New York Agricultural Experiment Station, Geneva, N. Y.

MICHIGAN

T. Glenn Phillips, Charlevoix Bldg., Detroit
Michigan State College, East Lansing
Sacred Heart Seminary, Detroit
Starr Commonwealth, Albion
H. O. Whittemore, University of Michigan, Ann Arbor
Hematite Township High School, Amasa
Ann Arbor Public Schools
Hartland Consolidated School, Hartland
Raymond Hill Wilcox, Union Guardian Bldg., Detroit
Duns Scotus College, Detroit
Starr Commonwealth for Boys, Albion
Grosse Pointe High School, Grosse Pointe

MINNESOTA

Hugh Vincent Feehan, 1004 Marquette Ave., Minneapolis
Robbinsdale High School, Robbinsdale
Tracy High School, Tracy
College of St. Scholastica, Duluth
Morell & Nichols, Inc., 1200 Second Ave., South, Minneapolis
University of Minnesota, Minneapolis
Washington State College, Pullman
Carleton College, Northfield

MISSOURI

Hare & Hare, 114 W. 10th St., Kansas City
University of Texas, Austin
Wyandotte High School, Kansas City, Kans.
63 Schools, Fort Worth, Texas
John Noyes, Railway Exchange Bldg., St. Louis
Mary Institute, St. Louis
St. Louis Country Day School, St. Louis
Webster Groves Schools, Webster Groves

NEW JERSEY

Brinley & Holbrook, 21 South St., Morristown
Trenton Teachers College, Hillwood
State Home for Girls, Trenton
State Normal School, Jersey City
Michael M. Burris, 115 Van Nostrand Ave., Englewood
Bergen Junior College, Teaneck
Teaneck High School, Teaneck
Bergenfield Junior High School, Bergenfield

NEW YORK

Briggs & Stelling, 10 E. 40th St., New York (also Charleston, S. C.)
Junior High Schools, Newburgh
Junior and Senior High School, Dobbs Ferry
Glenn H. Curtiss Memorial School, Hammondsport
A. F. Brinckerhoff, 101 Park Ave., New York
Connecticut College, New London
Trinity College, Hartford, Conn.
Wesleyan University Infirmary, Middletown, Conn.
Harold A. Caparn, 144 E. 30th St., New York
Lebanon Valley College, Annville, Pa.
Brooklyn Botanic Garden, Brooklyn
Manhasset Valley School, Manhasset
Laurie D. Cox, 136 Kensington Place, Syracuse
Acadia University, Wolfville, Nova Scotia
Hudson High School, Hudson
Mamaroneck High School, Mamaroneck
Alling S. DeForest, 16 Fair Place, Rochester
High School and North Street School, Geneva
Villa Chantill, Rock Island, Ill.
Colgate-Rochester Divinity School, Rochester
Byrant Fleming, Wyoming
Cornell University, Ithaca
Toronto University, Toronto, Canada
District School, Wyoming
Francis Hastings Gott Associates, 920 Merchants Rd., Rochester
Charlotte Junior-Senior School, Rochester
Brockport Central School, Brockport
Richfield Springs Central School, Richfield Springs
William E. Harries, 110 Franklin St., Buffalo
Elba Central School, Elba
High School, Wilson
Wyoming Central School, Wyoming
Roeder J. Kinkel, Statler Hotel, Buffalo
Evangelical Training School, Dunkirk
Batavia High School, Batavia
Alfred University, Alfred
Charles Downing Lay, 515 Madison Ave., New York
High School, Watertown, Conn.
Union College, Schenectady
New York State Normal Training School, Cortland
H. B. Littlefield, "Little Field," North White Plains
Central High School, Hancock
High School and Stadium, White Plains
Battle Hill School, White Plains
Charles N. Lowrie, 101 Park Ave., New York
Yale University Athletic Fields, New Haven, Conn.
Lawrenceville School, Lawrenceville, N. J.
Montclair Academy, Montclair, N. J.
William Pitkin, Jr., and Seward H. Mott, Inc., 36 St. Paul St., Rochester
University of Michigan, Ann Arbor
Kent State University, Kent, Ohio
Kalamazoo College, Kalamazoo, Mich.
Richard Schermerhorn, Jr., 342 Madison Ave., New York
St. Anthony's Seminary, Catskill
Albany Academy, Albany
Rensselaer Polytechnic Institute, Troy
Jacob John Spoon, Inc., 4 Orchard Drive, White Plains
Academy of St. Joseph-in-the-Pines, Brentwood
Penn. Township School Dist. High School Grounds, Bernville, Pa.
Central School District No. 1, Pine Plains
Vitale & Geiffert-Gilmore D. Clarke, 101 Park Ave., New York
University of Illinois, Urbana
Hunter College, New York
New Jersey College for Women, New Brunswick

NORTH CAROLINA

E. S. Draper Associates, 2038 Beverley Dr., Charlotte
Winthrop College, State College for Women, Rock Hill, S. C.
Lanier Memorial School, Langdale, Ala.
Agnes Scott College, Decatur, Ga.

OHIO

Alexander & Strong, 4500 Euclid Ave., Cleveland
Lake Erie College, Painesville
University School, Cleveland
Mentor Village School, Mentor
A. D. Taylor, 4614 Prospect Ave., Cleveland
Oregon State University, Corvallis
Carnegie Institute of Technology, Pittsburgh, Pa.
Notre Dame College, Cleveland

PENNSYLVANIA

Wheelwright & Stevenson, 225 S. 15th St., Philadelphia
The Gunnery School, Washington, Conn.
St. Andrews School, Middletown, Del.
Muhlenberg College, Allentown

VIRGINIA

Albert A. Farnham, Roanoke
Hollins College, Hollins
Virginia Polytechnic Institute, Blacksburg
Jefferson High School, Roanoke
Charles F. Gillette, 105 E. Cary St., Richmond
William and Mary College, Williamsburg
Mary Baldwin College, Staunton
The Novitiate, Jesuit College, Wernersville, Pa.

WISCONSIN

Phelps Wyman, 759 N. Milwaukee St., Milwaukee
State Teachers College, Milwaukee
State Industrial School For Girls, Oregon
Lincoln High School, Wisconsin Rapids

COLDWELL LAWN MOWER COMPANY

Manufacturers of

Hand, Horse and Motor Lawn Mowers

Newburgh, N. Y.

SINCE 1867

COLDWELL POWER MOWERS AND HAND MOWERS

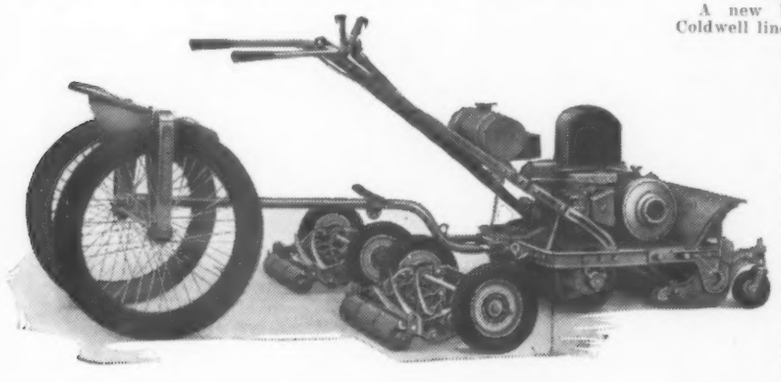
MODELS FOR EVERY TYPE LAWN AND EVERY PURPOSE

Educational directors, Superintendents of Schools and Universities and others having large lawns to maintain find that the Coldwell line of mowers covers every possible requirement and that the operating performance of each and every one of the many models leaves nothing to be desired.

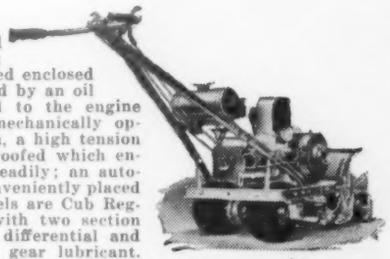
For more than seventy years—ever since 1867—the Coldwell Lawn Mower Company has been studying lawn mower problems in all their aspects, and there is now available a mower that exactly fits each requirement, whether for large-scale mowing or for trimming neatly close up to a wall, walk or hedge.

In 1897 Coldwell built the first power lawn mower in America, and now every model represents the latest in manufacture, is constructed by experienced workmen and exhaustively field tested. Coldwell power mowers are not for the purpose of merely cutting grass at low operating cost. They are built to do their great share in the maintaining of a beautiful lawn. Mowing, rolling and trimming are accomplished at a minimum of time and expense. Anyone can operate them because of their simplicity of design and ease of operation.

For large-scale work, use one of the Coldwell Super Twin Mowers, with heavy duty gang units. Illustrated below is the Super L Twin, Rubber Roller Model, with Riding Sulky and pneumatic tires on the gang units, 60″ cut. Coldwell Super Twin Models house an abundance of power and are designed for large areas. Large widths of cut are made by the addition of extra cutting units. There is plenty of power for grades and when the Sulky is attached the operator can ride it. As a single unit it can be used for trimming along driveways and walks, around trees and flower-beds. The gang mower cutting units contain steel cut gears enclosed in dirt-proof housing, the wheels run on roller bearings and they are equipped with heavy metal wheels or pneumatic tired wheels. The units are equipped either with sectional iron or rubber covered guard rollers. They are designed for heavy duty work, as their name signifies. Other models are Super L Twin with four gangs, 94″, Super Twin Thirty with two gangs, 65″, Super Twin Thirty with four gangs, 100″.

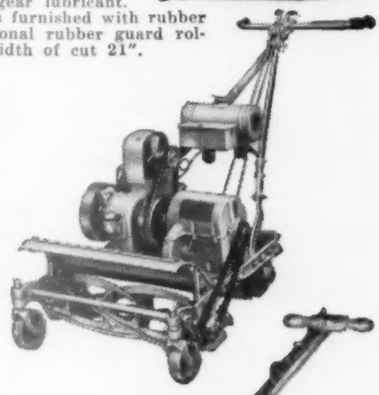


COLDWELL CUB DE LUXE



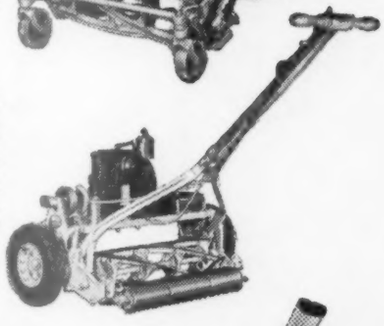
A first-rate all-'round machine with three speeds; single cylinder, water cooled enclosed motor; lubrication supplied by an oil pump that forces the oil to the engine bearings, cylinders and mechanically operated valves; the ignition, a high tension magneto specially waterproofed which enables the motor to start readily; an automotive type carburetor conveniently placed on the motor. Other models are Cub Regular which is furnished with two section iron roller with enclosed differential and beveled gears running in gear lubricant. The Rubber Roller model is furnished with rubber covered drive rollers, sectional rubber guard rollers and caster rollers. Width of cut 21″.

COLDWELL L JR. REGULAR



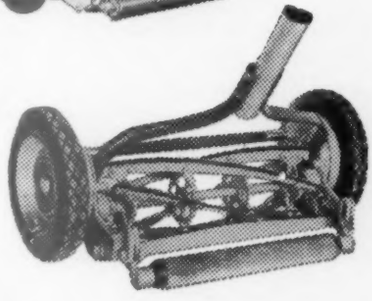
Illustrated at the right is a Coldwell L Junior 25″, equipped with a single cylinder, water cooled enclosed motor. There is sufficient power in the motor to cut thru the heavy grass as well as to negotiate steep grades. Other L Junior Models are L Junior Deluxe, L Junior Rubber Roller and L Junior with 16″ gangs, cutting 52″.

COLDWELL BROWNIE



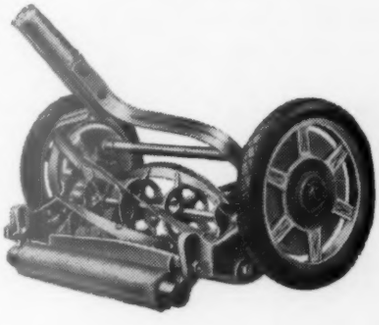
An amazingly low priced model which has many of the proved mechanical features of the higher priced models. Compact and sturdy, easy and economical to operate and particularly adapted for small estates and recommended for trimming in parks, cemeteries and around schools. Width of cut 19″.

AMBASSADOR DE LUXE



A quality hand mower of medium weight, equipped with Goodyear pneumatic tires. Useful as a general all-purpose machine for well-kept lawns; handy on both small grass plots and large areas requiring minimum attention. Width of cut 16″, 18″, 20″.

NEW IMPERIAL SPECIAL



A new leader in the Coldwell line of hand mowers: — the old Imperial completely modernized, with several new, unusual features. A machine that will really last a lifetime. Width of cut 16″, 18″ or 20″.

Grass catchers can be furnished for all Coldwell Power Mowers.

IDEAL POWER LAWN MOWER CO.

440 Kalamazoo Street, Lansing, Mich.

NEW YORK BRANCH
12 Harrison Street
New Rochelle, N. Y.

CANADIAN DISTRIBUTORS
Aikenhead Hardware Ltd.
17 Temperance Street, Toronto, Ont.

IDEAL Caretaker

AN IMPLEMENT OF YEAR ROUND UTILITY

A POWER LAWN MOWER, a Power Sweeper, a Power Roller all in one convertible combination—the **IDEAL** Caretaker. A machine that marks the most practical development in lawn care equipment since the invention of the power mower.

The **mower** assembly embodies advantages found in no other mower. Full-floating, power-driven cutting unit with 8″ reel. Will trim close around flower beds, drives, etc., and will handle a wide variety of mowing conditions with maximum efficiency.

The **sweeper** assembly offers an efficient method of windrowing leaves in the fall, sweeping dead grass and debris from lawns in the spring, sweeping snow from walks, driveways, platforms and skating rinks in the winter.

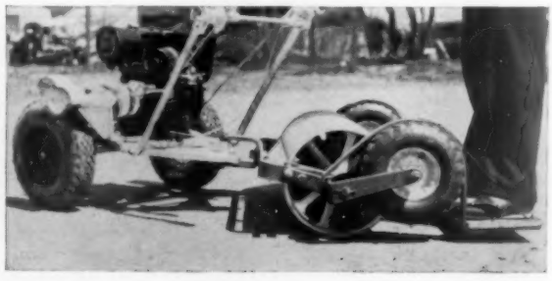
It takes less than 30 minutes to convert the "Caretaker" from a power mower to a power sweeper or vice versa—and the power unit will haul lawn roller, spiker, etc. Truly an implement of practical, year round utility.

The **roller and spiker** combinations solve an important part of the lawn-conditioning problems from early spring to late fall.

Angle type sweeper can be used for sweeping snow from walks, drives, skating rinks, etc.

Angle type sweeper will windrow leaves four times as fast as a man can rake

Straight type sweeper can be equipped with dirt box for both indoor and outdoor sweeping jobs



Power unit will haul lawn rollers, tennis roller, spikers, etc.

A COMPLETE LINE OF ROLLER TYPE AND WHEEL TYPE POWER MOWERS, TRACTOR MOWERS AND GANG MOWERS

IDEAL "MASTER"—Roller Type

Two Sizes—25″ cut, 30″ cut

A combination power mower and roller of simple design and extra sturdy construction for heavy duty service. Well adapted to large open areas where continuous hard daily service is encountered, and where long life and low upkeep are essential.

Extra equipment—Trailer Units (on 30″ model)—Riding Sulky, Grass Catcher.

IDEAL "VICTOR"—Wheel Type

Two Sizes—22″ cut, 30″ cut

The Victor model wheel type mower is made in two sizes. A light weight, easy handling machine recommended for use on lawns where there is a large amount of close cutting around trees, shrubbery, etc. Available with steel wheels or air tires.

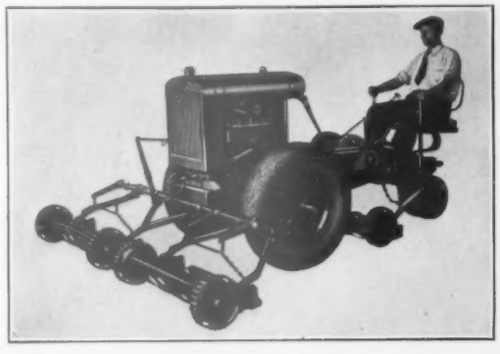
Extra equipment—Weed Cutter, Grass Catcher; and on 30″ size Riding Sulky, Trailer Units.

IDEAL "MAJESTIC"—Roller Type

Two Sizes—22″ cut, 30″ cut

A roller type mower with power driven reel—recommended for use on extra fine, smooth lawns where a close, clean high quality cutting job is demanded. Used extensively on lawns of Creeping Bent and Bermuda. Close coupled, compact and easily handled around shrubbery, flower beds, etc.

Extra equipment—Weed Cutter, Grass Catcher; and on 30″ size Riding Sulky, Trailer Units.



IDEAL POWER TRIPLEX

Junior Model 70″ cut—Senior Model 84″ cut

For mowing jobs where big capacity is demanded the Ideal Triplex has no equal. Capacity up to 35 acres per day. Power steered. All three units cut ahead of tractor wheels. Hand lever to lift units off the ground. Quickly and safely transported from one job to another.

Extra equipment—Snow Plow for sidewalks and driveways.

For full Details and Prices, Write for our General Catalog

JACOBSEN MANUFACTURING CO.

740 Washington Ave., Racine, Wisconsin

FACTORY BRANCH: 101 Park Ave., New York

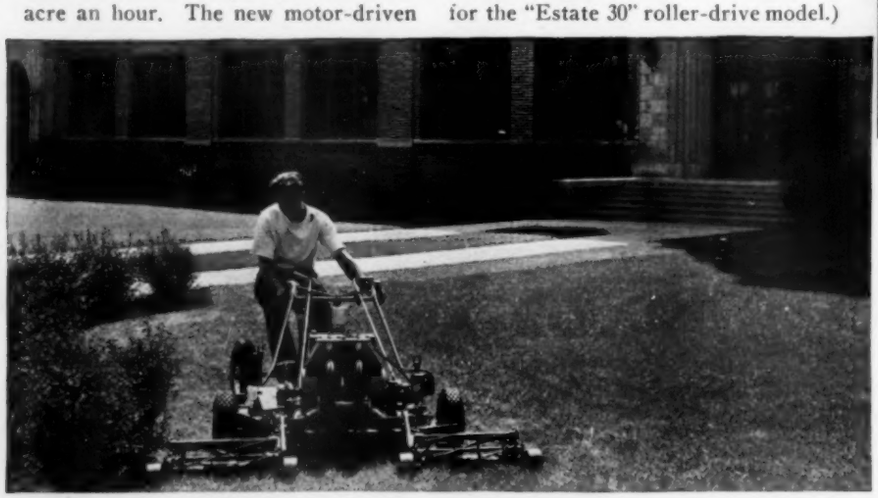
POWER MOWERS FOR LAWNS OF EVERY SIZE

TO provide the greatest economy in caring for lawns of every character, Jacobsen Power Lawn Mowers are built in both wheel and roller types, with cutting widths ranging from 20 inches to 64 inches and price from $140.00 up. Each model is designed for a specific type of service by America's foremost power mower engineers.

Jacobsen Power Mowers are now used by schools and universities in all parts of the world for cutting every kind of grass. No matter what type or size lawn you have to cut, you can select a "Jacobsen" that will fit your requirements with the assurance that no other power mower offers such fine engineering, sturdy construction, efficient performance and economical operation.

The "TWIN" and Power-Driven Side Units

The Jacobsen "Twin" is the biggest, fastest self-propelled power mower on the market. On large acreages it brings the per-acre cost of mowing to the lowest figure yet attained. With 32-inch cut and plenty of power for steady operation at 4 miles an hour, the "Twin" has a capacity of easily an acre an hour. The new motor-driven side units double the width of cut and capacity of the "Twin." Their frequency of cut is the same as the "Twin"—and they work right over the edges of walks or spaded beds, under shrubbery and close to trees, eliminating most hand trimming. (Power-driven wing units are also available for the "Estate 30" roller-drive model.)



"4-ACRE" And Power-Driven Trimmer Unit

Introduced in 1921, the "4-Acre" has each year entrenched more firmly its position as the all-around favorite for schools and universities. Year by year the "4-Acre" has been refined in details of construction and major improvements have been added from time to time. Its newest feature is the power-driven trimmer unit for the 24-inch model. It reaches under shrubbery, over the edges of walks, curbs, spaded beds and trims within two inches of obstructions. The trimmer has a cutting width of 14 inches. When folded it leaves the "4-Acre" its regular front and side clearance.

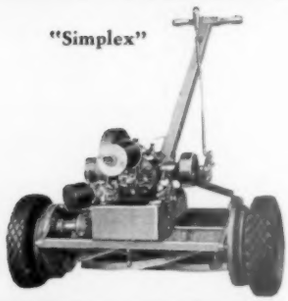
CUTTING WIDTHS FROM 20 TO 64 INCHES . . . WHEEL AND ROLLER DRIVE

"Estate 30"

"Estate 20"

"Sturdex"

"Simplex"



SEND FOR DESCRIPTIVE CATALOG OF JACOBSEN POWER MOWERS

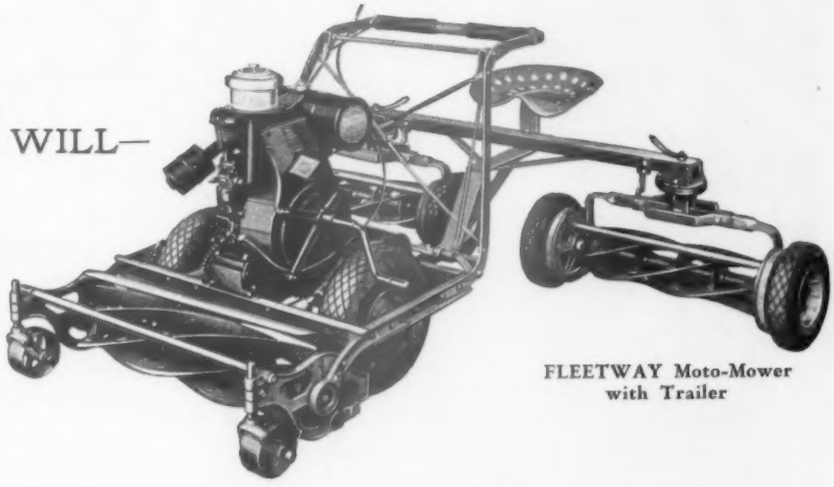
THE MOTO-MOWER COMPANY

MAIN OFFICE
4600 Woodward Avenue
Detroit, Michigan

THIS MANY PURPOSE MOTO-MOWER WILL DO *All* YOUR HARD WORK—WINTER AND SUMMER

The FLEETWAY WILL—

- MOW YOUR LAWN
- CUT YOUR WEEDS
- TRIM YOUR EDGES
- ROLL YOUR LAWN
- REMOVE THE SNOW FROM YOUR WALKS
- SPRAY YOUR TREES AND SHRUBS



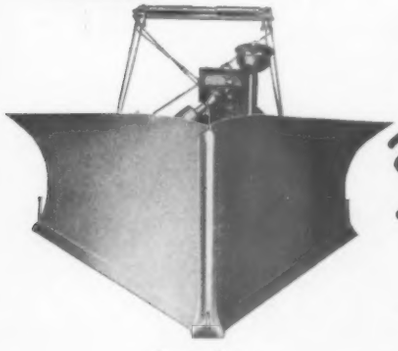
FLEETWAY Moto-Mower with Trailer

YOU can ride it—walk with it—go fast or slow—change to any of the equipment shown in a short time. Cuts 32″ swath on single unit—72″ swath on trailer units and 42″ swath with sickle bar. Twin water weight rollers 48″ wide. Sprayer will reach 75 to 100 feet high with bamboo rod. This FLEETWAY Moto-Mower is used by cities and schools at Chicago, Rochester, Cincinnati, St. Louis and many other cities, as well as by such firms as Ford Motor Company and General Motors Corporation.

Hardie Sprayer

Moto-Mower with Sickle Bar

There are 14 models of Moto-Mowers —one for every need and pocketbook. For full information on the FLEETWAY and all other Moto-Mower models, write for our complete catalog.



Snowplow

Moto-Mower

THERE'S A MOTO-MOWER DEALER NEAR YOU

Water Weight Roller

EVINRUDE MOTORS MILWAUKEE

4143 North Twenty-Seventh Street,
Milwaukee, Wisconsin

THE MODERN, ONE-HAND, LOW-COST MOWING MACHINE

Extremely maneuverable because of its compactness and free wheeling features, the Lawn-Boy is really unsurpassed for mowing in congested, uneven grass and stone-infested areas and easily outmows many larger mowers on open areas.

CUTS CLOSER

Lawn-Boy mows closer to curbs, walls, trees and hedges than most hand and power mowers. A twist of the handle locks it for quick cutting with power that does away with costly hand trimming.

CUTS UNIFORMLY—4 CUTTING HEIGHTS

Lawn-Boy cuts more smoothly in troughs, on crests, up or down hill. Simple wheel adjustment provides ⅝", 1", 1⅜" or 1¾" cut.

LIGHT WEIGHT—RUNS ALL DAY ON 20c. WORTH OF FUEL

Lawn-Boy is sturdily built for day-in, day-out heavy mowing. Compact, clever design keeps weight low; results in easy handling and low operating cost.

EVINRUDE LAWN-BOY Power Mower

EASY ONE-HAND MOWING

The operator needs only to guide the Lawn-Boy with a light carry-grip on the control handle. The instant he pulls back on the handle the mower stops. Motor and reel keep on running, but the drive wheels are disengaged. Normal release of the control handle again sets the drive wheels in motion. Operating a Lawn-Boy is so natural that it seems that the mower and operator are one, so perfectly does it obey the hand that guides it. There is little weight on the handle, and there is no side to side jerking.

AUTOMATIC START-STOP CONTROL

Occasionally the operator may wish to stop mowing to remove some object in his path. He merely drops the handle . . . Lawn-Boy stops instantly . . . the motor keeps running . . . mowing is resumed by merely returning the handle to normal position. Operation is so simple, so automatic—a mere boy operates the Lawn-Boy easily.

Rubber Tires

RUBBER TIRES

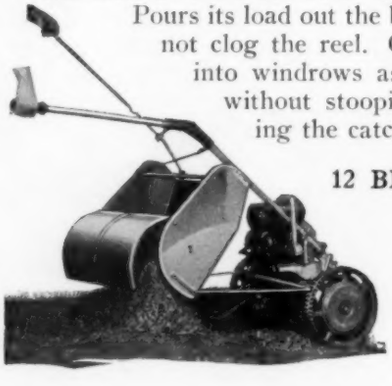
Thick, semi-hard tires vulcanized to wheels. Safeguard trees, walks, monuments, markers, etc., from bruising and chipping. Add greatly to silent operation.

STURDY 4 CYCLE ENGINE

Lawn Boy's easy-starting engine runs all day on a gallon of fuel. It is air-cooled, will not overheat, is simple and remarkably silent. Other features: Starting lever (no cord), governor, accurate mechanical balance.

ONE-HAND ALL-METAL GRASS CATCHER

Pours its load out the back so cuttings cannot clog the reel. Cuttings drop easily into windrows as you walk along—without stooping, without detaching the catcher. Price. . . .$8.50



12 BIG FEATURES

12 unique Lawn-Boy features are shown in our complete free catalog-folder. Send for a copy today.

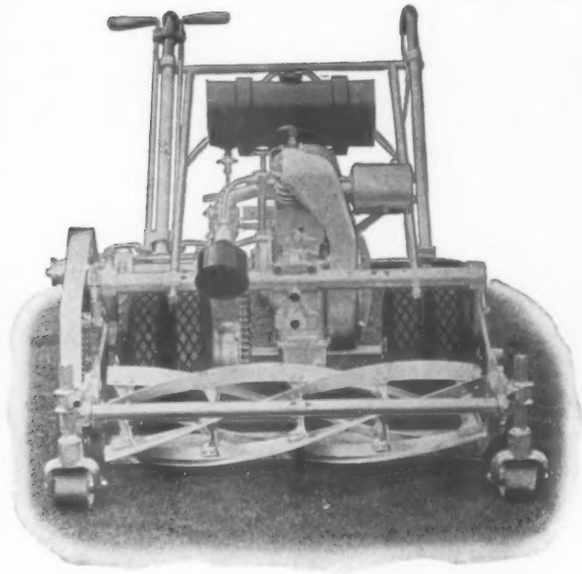
TORO MANUFACTURING CORPORATION

America's Largest Builders of Power Grass-Cutting Machinery

3042–3206 Snelling Ave., Minneapolis, Minn.

TRACTORS — POWER LAWN MOWERS — ROLLERS

Write for Complete Catalog



THE TORO PARK SPECIAL Now Available with Dual Pneumatic Drive Wheels

. . . size 12 x 3 Goodyear, and with rubber treaded front caster wheels . . . especially appreciated for crossing hard surfaced roads or walks.

The new Toro Hi-Duty 3 H. P. motor, now standard equipment, gives the Park Special fifty per cent more power and greatly increases its field of usefulness. Makes a 30-inch cut. Will climb steep hills and cut the heaviest turf. Will handle diskers, drag mats, sickle bars, renovators, gang mowers and other attachments.

THE TORO PARKMASTER

For any school or institution faced with the problem of cutting scattered areas quickly and economically, no machine can equal this sturdy Master tractor equipped with three 30-inch mowers. It has a seven foot cutting swath, and is equipped with a lifting device so that, without the driver leaving his seat, the mowers can be easily raised for crossing curbstones and transporting long distances over pavements.

TORO IMPROVED POWER ROLLER

Eliminates tedious hand rolling for tennis courts and athletic fields. Rolling width 30 inches. Weighs (with operator) about 1250 lbs. Speed up to 3½ M. P. H. Forward and reverse gear obviates constant turning. Toro standard 4-cycle, air-cooled motor . . . 3 H. P.

GRAVELY MANUFACTURING COMPANY

Box 801, Dunbar, W. Va.

One GRAVELY Solves Three Important Maintenance Problems

Among schools and institutions throughout the country where better than-the-usual appearance is demanded at a minimum of cost you'll find GRAVELY Equipment on the job. Why?

Because the GRAVELY offers you a quick change between two completely power-driven mowing units. For the fine lawns there's the 30 inch Reel Type Mower. Then, for the large acreages of rough mowing, use the 42 inch GRAVELY Sickle Mower.

In the winter you simply attach the GRAVELY Sidewalk Snow Plow and your snow removing problem is economically solved.

Mowing on the steepest hillsides, the roughest ground, and even day-in and day-out operation are no test for the ability of this sturdy little machine. It's built to stand up under the toughest assignments. That's why it's such an outstanding favorite with people who demand efficiency for maintenance equipment.

The GRAVELY Sickle Mower has long been recognized as the most efficient Mower of the Sickle Type. Here you have the Mower out in front where you can see just what you are doing. The bar has the GRAVELY Patented Swivel Action which allows it to follow the contour of the ground regardless of the position of the machine.

"A little giant for power" is an actual description of the Model L GRAVELY. Its two forward speeds and a reverse give you a selection of speed and power needed for the job. You need not go too fast on the rough jobs where power is needed. Nor is it necessary to waste time when the going is smooth for you control both the speed and power from one to six miles per hour.

The five horse power, air-cooled GRAVELY Motor has plenty of power to operate both the mowing units and the Tractor—even with a riding attachment for the operator, if desired.

All of the attachments shown are used on this same machine. To change attachments requires only five minutes' time—you need only remove four bolts.

The GRAVELY Sidewalk Snow Plow is quickly and easily attached to the GRAVELY Tractor. It is designed especially for this machine. The width of the plow may be adjusted from 40 to 54 inches—also the manner of throwing the snow may be controlled according to the work to be done. Then, too, a one-way blade type snow plow is available for this same machine.

If you've been removing snow by hand, you know the cost. This plow is efficient—the price is reasonable. Why not save the difference?

WRITE FOR OUR GENERAL CATALOG

SPRINGFIELD LAWN SWEEPER

MOTO-MOWER COMPANY, Detroit, Michigan — Sole Selling Agents

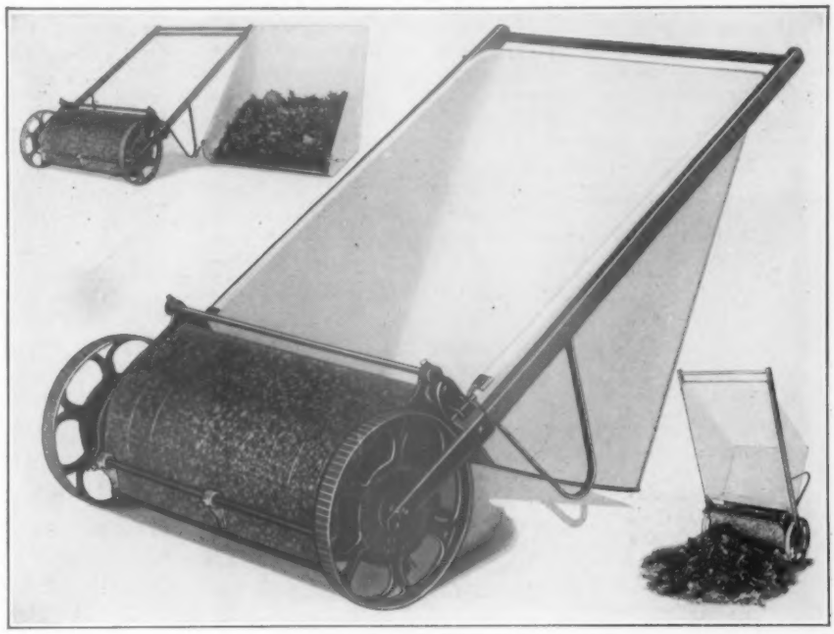
THE SPRINGFIELD LAWN SWEEPER

For Better and More Beautiful School Grounds

The Springfield Lawn Sweeper will beautify your school grounds. It gently lifts and collects paper, leaves, sticks, stones and grass cuttings without harm to the growing grass. Leaves lawns neat, attractive and free from any debris which might interfere with the proper growth of the grass.

It is most valuable for quickly and neatly cleaning up around school buildings and grounds. It runs as easily as a lawn mower, operating with a soft, easy, whirling, sweeping movement which cannot injure the lawn.

Do not use antiquated tools that damage the lawn by tearing the grass and failing to remove debris thoroughly. Use the Springfield Lawn Sweeper for maintaining beautiful lawns economically.



Model F

MODEL "F" CONSTRUCTION DETAILS

Model F is made in two sizes—28″ and 36″ brush. The brush reel, 12 inches in diameter, contains 6 individual brushes of tough, durable bassine fiber, which are adjustable for either close or light sweeping. Brush reel brackets and side plates are aluminum, making the sweeper light and quickly responsive in action. Brush reel bearings are of bronze, insuring long life. Collecting hopper is made of heavy canvas with steel supporting frame. The handle is adjustable to suit operator.

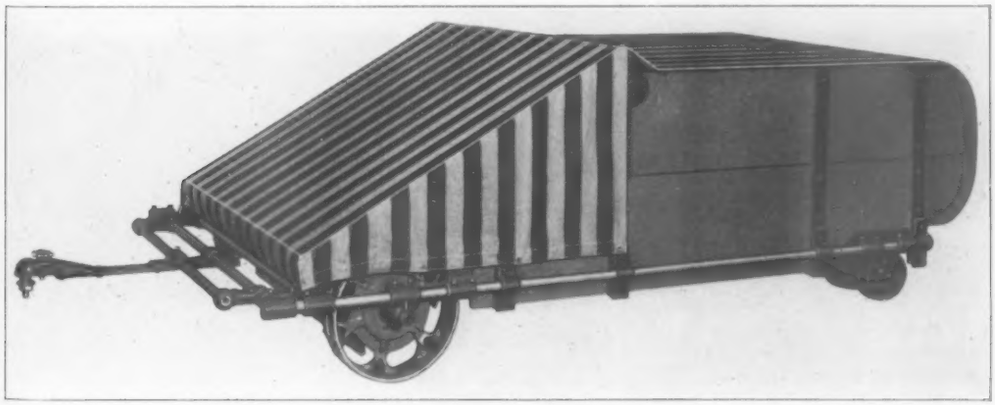
Model F is low in initial cost, economical in upkeep; strong, durable, sturdily constructed, mechanically simple, easily operated; does much work in a short time; a profitable investment.

For Large Open Spaces—

THE SPRINGFIELD TRACTOR OR HORSE-DRAWN SWEEPER

(Model B, illustrated)

This sweeper is worthy of your serious consideration from a dividend-paying basis, if your school grounds are large.



Model B
Tractor or Horse Drawn

Brushes — six to the reel (44 inches long).

Trash Box — very large entirely enclosed by canvas apron. Outside sweeper dimensions: Approximate width 5 ft. Approximate length 8 ft.

Hitch — automobile trailer hitch.

Economize with one of these **large Springfield Sweepers.**

Write for Illustrated Descriptive Circular.

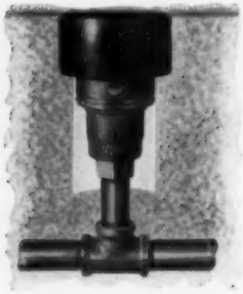
MOTO-MOWER CO., 4600 Woodward Ave., Detroit, Mich.

BUCKNER MANUFACTURING CO.

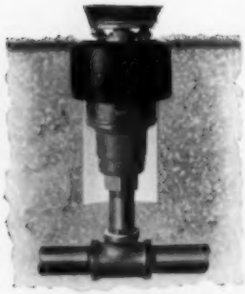
Pioneers and Leaders in Hose and Hoseless Irrigation

1615 Blackstone Ave., Fresno, California 418 North Broad St., Elizabeth, New Jersey

Whatever your sprinkler requirements, Buckner Manufacturing Company has built equipment in such a wide range of performances as to be sure to fit your particular operating conditions. BUCKNER Valves and Sprinklers have been adopted as standard equipment in a large number of schools and colleges. The Buckner Manufacturing Company is the pioneer and leader in **hoseless** irrigation, but manufactures also a complete line of sprinklers for use with hose—a wide variety of types, to suit varying water supply conditions—all with the same high quality that characterizes all BUCKNER products.



"Pop - up" Sprinkler, installed flush with the turf



In operation, the "Pop - up" Sprinkler rises above the level of the turf

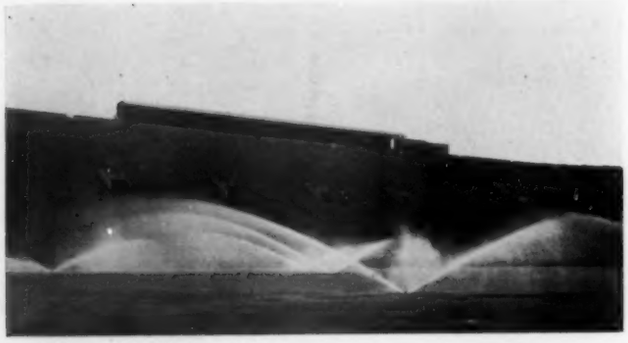
BUCKNER "POP-UP" SPRINKLERS

For quick, efficient watering of athletic fields, school grounds, etc., the **Pop-up** type of sprinkler is the ideal installation—simple, easy to operate —done entirely without labor. Proved by many years of use to be thoroughly dependable, durable, and free from repairs and adjustments, BUCKNER **Pop-up** installations are now in successful operation on hundreds of athletic fields.

For Athletic Fields

The illustration at the left shows the soft rubber cap-and-sleeve which covers the sprinkler completely, so that there is no metal to come in contact with anyone stepping on it—only an exposure of soft, thick rubber. Perforations prevent slipping, offering a sure footing so like the surrounding ground that players on the field cannot tell when they step on the exposed rubber.

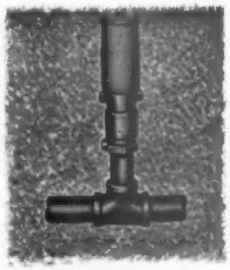
For ALL OTHER LAWN AREAS, these sprinklers are without the rubber protective covering.



BUCKNER "Pop-up" Irrigation System in operation on the field of the Palmer Memorial Stadium, Princeton University. Five batteries such as the one shown are used to give complete coverage

Operator setting a "Quick Coupling" Sprinkler in place

BUCKNER "QUICK COUPLING" WATERING EQUIPMENT

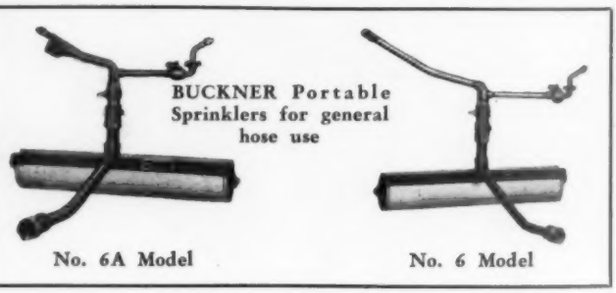


"Quick Coupling" Valve with rubber sleeve and cap, presents no hazard to players

BUCKNER **Quick Coupling** Sprinkler Equipment, developed by W. A. Buckner at Pebble Beach Golf Course, Del Monte, California, has been in use for many years in athletic fields and other sports turfs, with marked success. The **Quick Coupling** Valves — safe, economical, foolproof — are spaced at regular intervals; and the sprinklers, speedily attached by one man moving down the field, give effective coverage and even distribution of water over large areas.

Sprinklers are of two types —full-circle and half-circle. The latter is preferable whenever it is desired to confine the application of water to an area such as one side of a road, sidewalk or wall.

"Quick Coupling" Valve with Sprinkler in place



BUCKNER Portable Sprinklers for general hose use

No. 6A Model **No. 6 Model**

Our Engineering Department will gladly work out details to fit the requirements of your own school grounds or athletic field

THE COLE NURSERY COMPANY

Introducers of Truehedge Columnberry

Plant Patent No. 110

Painesville, Ohio

ESTABLISHED 1881

BEAUTIFY YOUR SCHOOL GROUNDS WITH

TRUEHEDGE COLUMNBERRY

HERE, at last, is a hedge as beautiful as boxwood, which it closely resembles, and as hardy as the common Japanese barberry. First introduced in July, 1934, it has been much sought after by school and college executives, as well as park superintendents, landscape architects and others interested in beautifying public grounds or private estates.

Truehedge Columnberry is as beautiful as boxwood, considerably lower in price, and infinitely more hardy. It is particularly welcomed in the north because it withstands severe weather conditions so admirably. It rapidly attains mature size, forming a dense hedge of glossy, deep green foliage. It may be quickly trimmed to make a formal hedge, or left untrimmed to make an unsurpassed semi-formal hedge. The density of this plant, as compared with common barberry, is almost unbelievable.

These actual photographs picture the unsurpassed beauty of Truehedge as developed by Mother Nature, untainted and unchanged by human hands. Individual trimmed and untrimmed specimens for accent and other spectacular purposes are easily attained. Individual columns, boxes, ovals, fans, and artistic topiary designs may be quickly created.

New Truehedge Columnberry — Common Barberry

Our free illustrated booklet describes in words and pictures the varied uses of Truehedge and also tells of the gratifying results obtained by many of the best Parks and Cemeteries of our country.

THE COLE NURSERY COMPANY grows a complete line of

"Everything That's Good and Hardy"

Shrubs, Shade and Ornamental Trees, Roses, Vines, Fruits and Perennials

Wholesale Catalogue on Request.
Inquiries appreciated.

DISTRIBUTORS

Plants are available at any of the following nurseries, or may be ordered direct from the Cole Nursery Company:

Adams Nursery, Inc., Springfield, Mass.
Bay State Nurseries, Framingham, Mass., and North Abington, Mass.
Fairview Evergreen Nurseries, Fairview, Pa.
Charles Fiore Nurseries, Prairie View, Ill.
Jackson & Perkins Co., Newark, N. Y.
Lester C. Lovett, Little Silver, N. J.
Henry A. Dreer, Inc., Philadelphia, Pa.
I. E. Ilgenfritz' Sons Co., Monroe, Mich.
R. M. Kellogg Company, Three Rivers, Mich.
Mount Arbor Nurseries, Shenandoah, Iowa
Shenandoah Nurseries, Shenandoah, Iowa
E. D. Smith & Sons, Ltd., Winona, Ontario
Storrs & Harrison Co., Painesville, Ohio
Vaughan's Seed Store, Western Springs, Ill.
Wayside Gardens Co., Mentor, Ohio

LARGE ILLUSTRATED BOOKLET DEPICTING TRUEHEDGE COLUMNBERRY SENT FREE ON REQUEST

Picture of TRUEHEDGE COLUMNBERRY taken immediately after first trimming, which consumed about thirty minutes per row with hedge shears; plants three years old; June, 1935

THE COLUMBIA ALKALI CORPORATION

Manufacturers of Columbia Calcium Chloride, Columbia Alkalies

Factories, General Offices: Barberton, Ohio

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616 South Third Street, Minneapolis, Minnesota
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Southern Alkali Corporation, Dallas, Texas
Grant Building, Pittsburgh, Pennsylvania

LAY DUST WITH COLUMBIA CALCIUM CHLORIDE

No need to endure driveways and playgrounds that scatter unhealthy dust onto lawns, shrubbery and through your buildings.

Get rid of this nuisance easily by spreading Columbia Calcium Chloride Flakes. They absorb moisture and make ground surfaces compact and dustless. Inexpensive, no odor, nothing to track or stain. Apply one or two lbs. per square yard with shovel or hand spreader.

Write for name of nearest distributor.

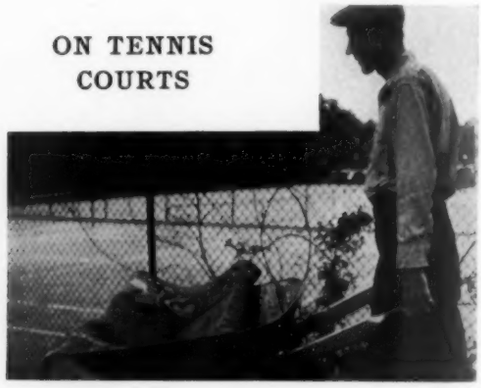
ON SCHOOL DRIVEWAYS

Easy to Apply with Shovel or Spreader

ON PLAYGROUNDS

ON BASEBALL DIAMONDS

ON TENNIS COURTS



ALSO FOR ICE REMOVAL

Handy for thawing ice on steps, sidewalks, frozen drains and driveways where skidding accidents occur. Effective down to 50 degrees below zero.

SOCONY-VACUUM OIL COMPANY, INC.

STANDARD OIL OF NEW YORK DIVISION

26 Broadway, New York, N. Y.

The De Veaux School for Boys, Niagara Falls, N. Y.
Road Construction with Socony Asphalt Products

SOCONY ASPHALT BINDERS
"B" AND "C"
SOCONY COLD PATCH ASPHALT

STANDARD BRAND SOCONY ASPHALTS AND ROAD OILS

SOCONY LIQUID ASPHALT
SOCONY ASPHALT PAVING FILLERS

Asphalt Macadam Roads

Asphalt Macadam Roads built by the Penetration Method are recognized by leading engineers as one of the most durable types of construction, being economical in cost and maintenance. This type presents a non-skid, all-weather surface, ideal for school and university grounds.

Socony Asphalt Binders "B" and "C" are widely used for such construction, in amounts varying from 2 to 3 gallons per square yard, being applied at temperatures ranging from 275 degrees to 350 degrees.

For Surface Treating of Gravel Roads and Paths

For economical treatment of dirt and gravel roads and paths, where it is desired to lay the dust and protect the surface with an Asphaltic mat, Socony Liquid Asphalts are produced in different grades to meet particular requirements. Socony Liquid Asphalts are usually applied in amounts varying from ¼ to ½-gallon per square yard and require a cover of sharp sand or clean gravel.

For Repairing Road and Path Surfaces

Socony Cold Patch Asphalt is an ideal patching material for repairing holes, ruts and depressions in all types of bituminous road surfaces. It is equally effective for restoring worn, uneven surfaces of brick and wood block pavements.

For each cubic yard of ½-inch to ¾-inch dry stone, we recommend the use of about 16 gallons of Socony Cold Patch Asphalt. Socony Cold Patch Asphalt is used without heating and is workable the year round.

For Filling Joints of Brick and Concrete Pavements

Socony Asphalt Paving Fillers (Standard Brand) for filling joints of brick, granite, and concrete pavements are especially refined Asphalts of high melting point. We also supply Asphalt Fillers containing mineral matter. Either of these grades is poured or squeezed to produce a rigid pavement.

ANCHOR POST FENCE COMPANY

Complete Line of Fences and Playground Equipment

Baltimore, Md.

SALES OFFICES IN PRINCIPAL CITIES

ANCHOR FENCES FOR SCHOOLS AND SCHOOL PLAYGROUNDS

The Anchor Post Fence Company has been serving public schools and colleges, municipalities and industrial plants with fencing and playground equipment to suit their various requirements for nearly half a century.

Anchor Chain Link Fences

Makers of America's first chain link fence, the Anchor Post Fence Company today manufactures a complete line, and will be glad to supply any interested school executive or architect with a copy of our Chain Link Fence Catalog containing full information about the four exclusive features which make an Anchor Chain Link Fence exceptionally attractive and durable. **Ask for Catalog No. 89.**

Anchor-Weld Iron Fences and Gates

Through the exclusive Anchor-Weld method of construction, the Anchor Post Fence Company is able to manufacture iron fences and gates which equal in appearance many expensive hand-wrought products. Many schools throughout the country are today justly proud of their beautiful Anchor-Weld Ornamental Iron Fences and Gates. Some of these are to be found illustrated in our **Catalog No. 83.**

Anchor Drive-Anchorage

Anchor's Four Exclusive Features

1. ANCHOR-WELD WIRE GATE—built with a frame of square tubular steel—arc-welded at the corners. The square shape of the heavy steel tubing, together with the welding of the corners, provides a framework of such exceptional strength that no re-enforcing diagonal braces are needed. We claim that this is the strongest and most attractive wire gate made.

2. SQUARE TERMINAL POSTS—stronger because they are square in section. More protective—having no fabric-holding bands and therefore providing no footholds for climbing. Better-looking—because of their graceful lines.

3. U-BAR LINE POSTS—made of high carbon steel and U-shaped in section to insure maximum strength.

4. DRIVE-ANCHORAGE—grips the soil like the roots of a tree. We have imitated nature's engineering by providing the line posts with a broad foundation. Anchor drive-anchors defy thaws, frosts and the many other strains to which a fence is subjected.

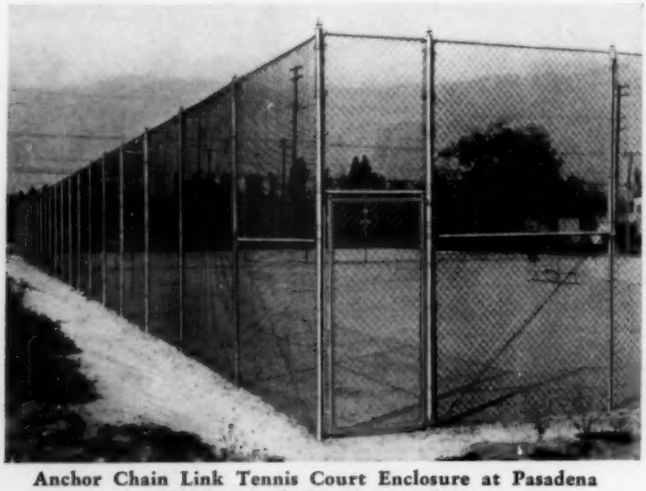
Note: While we strongly advocate the drive-anchor method of setting posts, we can, if desired, set our posts in concrete footings when conditions warrant such a procedure.

Anchor-Weld Wire Gate

Anchor Chain Link Fence with Top Rail
High School, Mineola, N. Y.

Anchor U-Bar Line Post

Anchor Square Terminal Post



Anchor Chain Link Tennis Court Enclosure at Pasadena High School, Pasadena, Calif.

Anchor-Weld Fence Surrounding the Hartford High School, Hartford, Conn.

CONTINENTAL STEEL CORPORATION

Manufacturers of Chain Link Fence for All Purposes

GENERAL OFFICE:
Kokomo, Indiana
Operating Plants: Kokomo, Indianapolis, Canton
SALES OFFICES IN ALL PRINCIPAL CITIES

Product . . . Service

Complete Chain Link Fence, including posts and fittings.
Gates and Gate Fittings.
Engineering and Erection Service.

Fabric

Fabric of Konik, containing copper, nickel and chromium—a stronger steel, rust-resistant clear through, of high tensile strength. Wire gauge No. 9 or 6 woven into a 2-in. chain link mesh. Top and bottom selvages of fabric are barbed.

Coating of heavy zinc applied by a special process of "hot dip" galvanizing to insure uniformity and adhesion of coating.

Posts

Line posts: H-Section, weight 4.3 pounds per foot or 2½″ O.D. tubular pipe, weight 3.65 pounds per foot. Spaced not more than 10 feet apart, on centers.

Terminal posts: Tubular steel pipe; end, corner, and pull posts 3″ O.D., weight 5.79 pounds per foot. Gate posts 3″ O.D. or larger, depending on width of gates.

Fence Styles

Continental offers 12 styles of top construction for chain link fence. The three most popular styles are illustrated at right.

Fabric Ties

No. 6 gauge, round aluminum. Six furnished to each 10 feet of top rail and one to each foot of line post height.

Tension Bands

These bands which hold fabric to terminal posts have a beveled edge and are slotted to receive special lock pin, eliminating bolts and nuts. One for each foot of fabric height.

Gates and Fittings

Single and double types, frames of heavy tubular pipe, corners electrically welded, or fitted with heavy malleable iron castings. Manually or mechanically operated.

Engineering Service

Our engineers are prepared to work with your plant engineers in laying out the most economical installation for your purposes.

Erection Service

Trained erection crews are available anywhere for correct and economical construction. When local labor is used Continental will supply competent foreman and inspection service.

14★ Construction Features

★ Fabric of *KONIK steel containing copper, nickel and chromium for greater strength and rust resistance clear through.

(* U. S. Patent No. 1874814.)

★ Heavy coating of zinc applied by a special process.

★ Full gauge wire woven in exact mesh.

★ Heavier "H" Section Line Posts.

★ Self Locking Barb Arm.

★ Heavier Post Caps and Arms.

★ More Post and Top Rail Ties.

★ Inside-Outside Top Rail Coupling.

★ New Type Lock Pin Eliminating Bolts and Nuts for Tension Bands.

★ Stronger and more easily operated Gates and Locking Devices.

★ Improved Pivot Type Hinge.

★ Quality Materials and each part designed for its particular place.

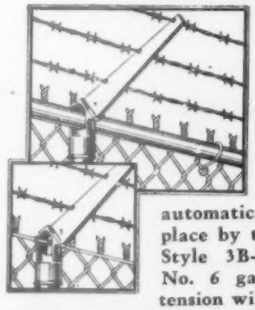
★ Engineered and erected for each specific job.

★ Continental CERTIFIED QUALITY materials and workmanship throughout.

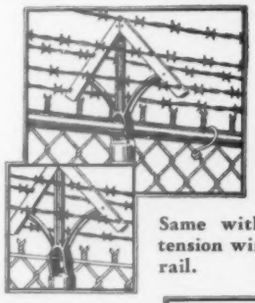
WRITE FOR "PLANNED PROTECTION"

For most complete manual on modern protection of property and control of traffic, just write for "PLANNED PROTECTION." Continental Steel Corporation, General Offices, Kokomo, Ind. Distributors in Principal Cities.

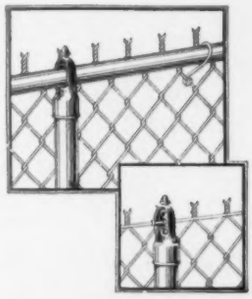
A STYLE TO MEET EVERY FENCING NEED



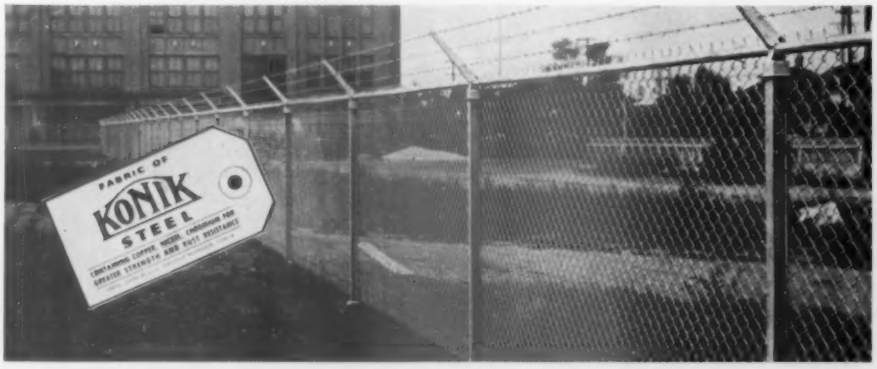
Style 3B - R—Three strands of barb wire with top rail. Arm of 12 gauge pressed steel. Barb wire held in angle slots and automatically locked in place by tension.
Style 3B-W—Same with No. 6 gauge coil spring tension wire instead of top rail.



Style 5B - R—Five strands of barb wire with top rail. Top rail of tubular steel 1⅝″ O.D. Has 7″ expansion sleeves.
Style 5B - W—Same with No. 6 gauge tension wire instead of top rail.



Style NB - R—No barb wire with top rail.
Style NB-W—Same with No. 6 gauge tension wire instead of top rail.



CONTINENTAL *Chain Link* FENCE

COPPERWELD STEEL COMPANY

GENERAL OFFICES AND MILLS

Glassport, Pa., U. S. A.

DISTRICT SALES OFFICES

New York, N. Y. Chicago, Illinois Atlanta, Georgia Dallas, Texas San Francisco, Cal.

"COPPERWELD"

non-rusting FENCE FABRIC and BARBED WIRE

COMBINE THE RUST-RESISTANCE OF PURE COPPER WITH THE STRENGTH OF ALLOY STEEL

No Maintenance here—it's Copperweld

Copperweld non-rusting fence around an athletic field. A permanent job!

WHY COPPERWELD NON-RUSTING FENCES COST LESS TO MAINTAIN

Copperweld Non-Rusting Fence Fabric is made from the same Copperweld wire that has been used so successfully by Electric Light and Power Companies, Railroads, Telephone Companies, etc., for more than twenty years. It has a core of alloy steel for strength, surrounded by a heavy layer of pure copper for protection against rusting. In Copperweld wire the heavy protective coating of pure copper is actually welded to the steel core—not plated on. Copperweld wire can't rust any more than solid copper wire can rust—yet it has all the strength of steel.

That's why Copperweld fences are non-rusting, never need painting, and cost less to maintain.

An enlarged cross section of Copperweld wire used in making Copperweld non-rusting fence fabric

Copperweld non-rusting fences—as well as Copperweld wire in its many other forms—have been tested in the laboratory of time. Many Copperweld fences have been in service in highly corrosive areas for periods up to fifteen years. Not one dollar has been spent for the painting of fence fabric on any of them.

Copperweld non-rusting fences are available through reputable fence companies everywhere. The initial cost of a Copperweld non-rusting fence is surprisingly low—quality considered—and its annual cost is the lowest of any fence made—because it never needs painting. Write to the Copperweld Steel Company, Box 500, Glassport, Pa., for complete information.

CYCLONE FENCE COMPANY

UNITED STATES STEEL

General Office: Waukegan, Illinois

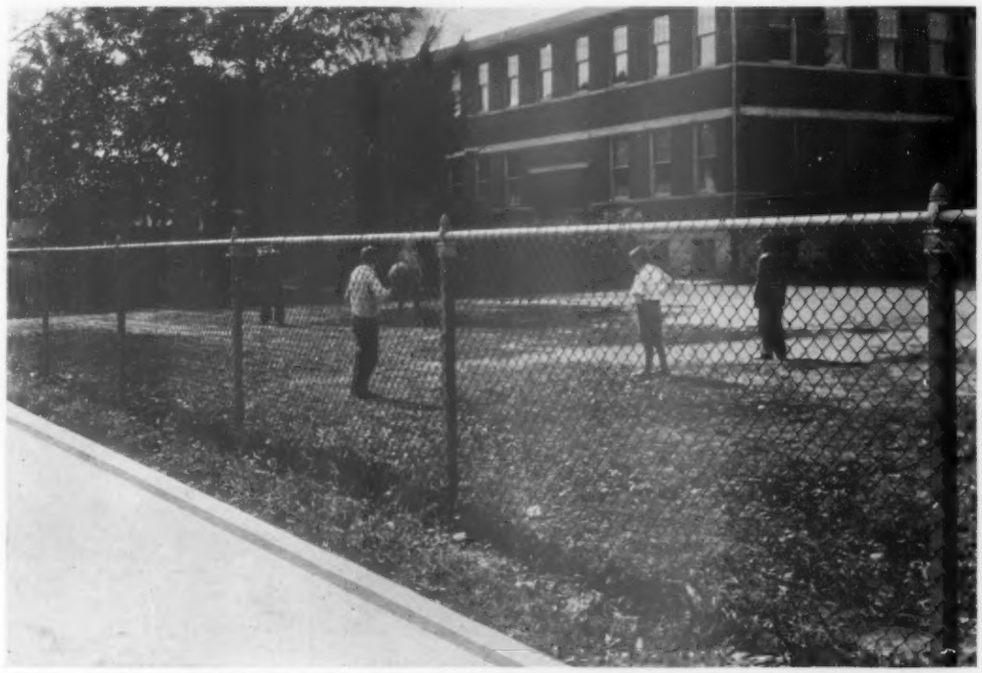
North Chicago, Ill. Waukegan, Ill. | Cleveland, Ohio Newark, N. J. | Fort Worth, Texas Greensburg, Ind. | Tecumseh, Mich. DeKalb, Ill.

PACIFIC COAST DIVISION
STANDARD FENCE COMPANY

Los Angeles | San Francisco | Oakland, Calif. | Portland, Ore. | Seattle, Wash.

Cyclone Fence is produced and erected by the world's largest manufacturers of property protection fencing. For years the Cyclone Fence Company has specialized in fencing school property. Cyclone Fence is the recognized standard for every school and playground purpose.

Enclose your school grounds with genuine Cyclone Fence to provide maximum protection for your school children.



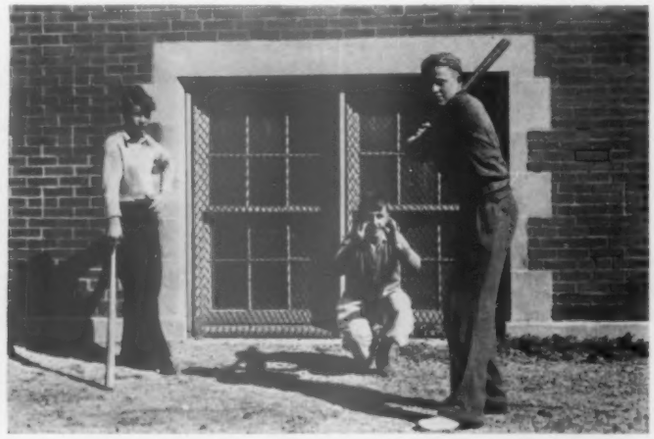
Cyclone Safeguard Chain Link Fence for School Grounds, Playgrounds, Parks, Institutions, Etc.

Fence your school Athletic Field with Cyclone and get more paid admissions to every game.

Because of its long, trouble-free service, you will find Cyclone Fence most economical in the end.

Learn how to test the value of any chain link fabric **before you buy.** Ask for a copy of the booklet "Fence—How to Choose It—How to Use It" and the Cyclone "12m" folder which shows how Cyclone's "12m" process of extra heavy galvanizing means longer fence life.

Cyclone Invincible Chain Link Fence for Athletic Fields



Cyclone Window Guards are sturdy—save money

PITTSBURGH STEEL COMPANY

Grant Building, Pittsburgh, Pa.

New York Chicago Philadelphia Cleveland Tulsa
Memphis Detroit Los Angeles Houston

Pittsburgh Chain Link Fences

THERE are five main types of Pittsburgh Chain Link Fences—each designed for a specific purpose, but all identical in analysis and quality of copper-bearing steel, in durability of hot zinc coating and in every essential of the complete fence.

Product of over 35 years of steel, wire and fence manufacturing experience, your Pittsburgh Chain Link Fence will give you all the service you will ask of it, combined with freedom from "nuisance" repairs and a distinctiveness that will add appearance-value as well as protection-value to your property enclosure. A simple sketch of your proposed fence lines will bring you complete recommendations and estimates—without obligation. Ask for the complete Pittsburgh Chain Link Fence Catalogue.

SPECIFICATIONS
"GUARDIAN" TYPE FENCE

(*No Barbed-Wire Top*) Standard Heavy Construction

These basic specifications are for "Guardian" type fence (no barbed-wire top). "Chieftain" (5-barbed-wire top) and "Custodian" (3-barbed-wire top) fences are the same except for the addition of barbed wire arms. "Residential" fence is in lower heights, and usually with somewhat lighter framework. "Tennis Court" fence is usually 1¾" mesh No. 11 gauge fabric on "Guardian" framework, with overhead transom gates. All types are also available in Stainless Steel at surprisingly low extra cost.

FABRIC—Pittsburgh Chain Link copper-bearing basic open hearth steel wire woven in 2" mesh, hot galvanized after weaving with heavy zinc coating. No. 6, No. 9 or No. 11 gauge wire woven in twisted and barbed finish. In all heights of non-barbed-wire-top fences, fabric is full height of fence. Barbed-wire-top types are one foot higher overall than actual fabric height. All fences are furnished in heights as desired. Fabric heights up to 12 feet are in one panel. Greater heights are in two (or more) panels.

LINE POSTS—2½" O.D. copper-bearing steel pipe, weight 3.652 pounds per foot. Optional: 2¼" H-section, weight 4.10 pounds per foot.

TOP RAIL—1⅝" O.D. copper-bearing steel pipe, weight 2.272 pounds per foot. Top rail may be omitted.

TERMINAL POSTS—End and corner posts 3" O.D. copper-bearing steel pipe, weight 5.79 pounds per foot.

SWING GATE POSTS—3" O.D. copper-bearing steel pipe, weight 5.79 pounds per foot, for single swing gates up to and including 6 feet opening and for double swing gates up to and including 12 feet opening. 4" O.D. copper-bearing steel pipe, weight 9.10 pounds per foot, for single swing gates wider than 6 feet up to and including 13 feet opening; also for double swing gates wider than 12 feet opening up to and including 26 feet opening. 6⅝" O.D. copper-bearing steel pipe, weight 18.97 pounds per foot, for single swing gates wider than 13 feet up to and including 18 feet opening; also for double swing gates wider than 26 feet opening up to and including 36 feet opening. 8⅝" O.D. copper-bearing steel pipe, weight 24.7 pounds per foot, for single swing gates wider than 18 feet opening and for double swing gates wider than 36 feet opening.

POST SPACING AND SETTING—Posts are regularly spaced in line of fence 10 feet center-to-center, and set 3 feet deep. In all cases posts are set in reinforced concrete footings (1:2:4 mix) crowned to shed water and protect post at ground line. Diameters of footings are 12" for terminal posts, 10" for line posts where fence is 7 feet and over and 9" for line posts where fence is 6 feet high.

BRACING—End, gate and corner posts are suitably braced with 1⅝" O.D. horizontal copper-bearing steel pipe braces, weight 2.272 pounds per foot, with an adjustable truss brace between each terminal post and the first line post; complete with fittings. Swing gate posts are furnished with auxiliary side braces where conditions require. Bracing is not included on 5-foot high fence with top rail.

POST TOPS—Heavily hot zinc coated malleable iron, designed to fit over post to exclude moisture.

TENSION BARS—¾" x ¼" tension bars; secured to terminal posts with bands; hot zinc coated.

BRACE AND TENSION BANDS—Heavy stampings of the latest approved type; hot zinc coated.

FABRIC BANDS—No. 6 gauge aluminum alloy of new improved self-tying design, eliminating unsightly buckles.

GATES—2" O.D. hot zinc coated copper-bearing steel pipe frames, weight 2.717 pounds per foot, with necessary intermediate braces of 1⅝" O.D. copper-bearing steel pipe, weight 2.272 pounds per foot. For special construction fence (2" O.D. line posts) gate frames are 1⅝" O.D.

GATE FILLER—All gates to be filled with fabric to match fence line.

HINGES—Latest type improved heavy duty ball-and-socket design, permitting 180° gate swing, centering gate weight to ground line, eliminating gate sag and preventing turning of hinges on posts.

LATCHES—Heavy duty plunger-bar clevis type, designed for positive padlock locking.

SPECIAL CONSTRUCTION—Guardian fence is also available with 2" pipe line posts and 2½" terminals to make an economical fence without loss of the advantages of regular Pittsburgh Chain Link Fabric.

Ask about Stainless Steel Pittsburgh Chain Link Fences

W. F. ROBERTSON STEEL & IRON COMPANY

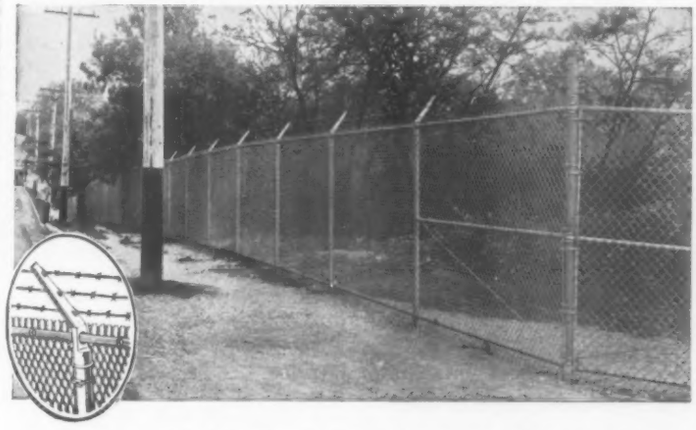
Robertson-Cincinnati Chain Link Fence

Second and Elm Streets, Cincinnati, Ohio

A ROBERTSON non-climbable Chain Link Fence is available in all styles to serve every purpose, Tennis Court Backstops, Athletic and Swimming Pool Enclosures, etc.

STANDARD TYPES: ROBERTSON STYLES 400 and 500, built in heights 3 ft. to 12 ft. inclusive, 6 ft. considered as standard. ROBERTSON STYLES 800 and 900 are recognized as the ideal constructions for Tennis Court Backstop Fences. They are available in three heights, 8, 10 and 12 ft., standard height 10 ft. FOR ATHLETIC FIELD ENCLOSURES ROBERTSON STYLES 600 and 700 are recommended. These styles have extension arms, carrying three or five strands of barbed wire, as preferred. On the five strand construction, the barbed wire extends on both sides of the fence line. Either style can be furnished in any height up to 12 ft., standard height 7 ft. overall, including barbed wire.

Robertson Style 900 Tennis Court Fence



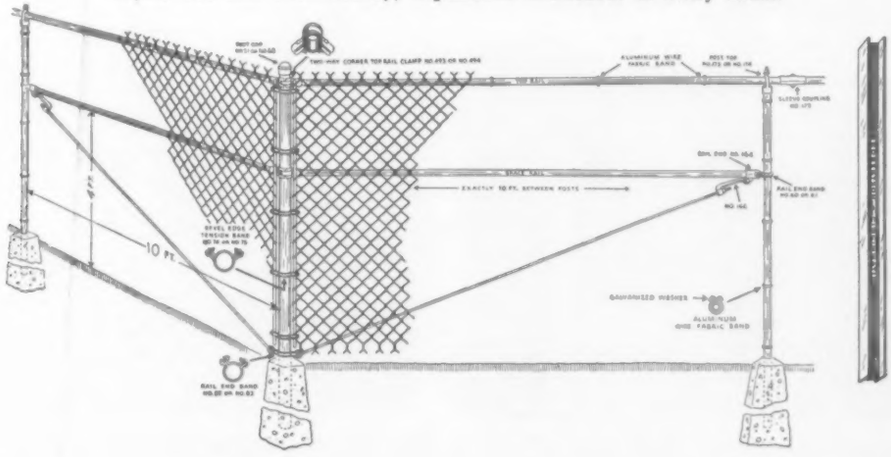
Robertson Style 600 Fence (3 strands of barbed wire at top)

ROBERTSON CHAIN LINK FABRIC is made of copper bearing steel of unusually high tensile strength, heavily galvanized by the hot dip process after woven, to meet any requirements. LINE POSTS are available in either the H-section style, weighing 4.3 lbs. per foot, or 2½" Outside Diameter (O.D.) tubular pipe construction, weighing 3.65 lbs. per foot. Standard spacing not more than 10 ft. on centers. TOP RAIL is 1⅝" O.D. tubular steel pipe, weighing 2.27 lbs. per foot. END AND CORNER POSTS made from 3" O.D. tubular steel pipe, weighing 5.79 lbs. per foot, all manufactured from copper bearing steel, galvanized by the hot dip process. BARBED WIRE 4 point pattern hot dip galvanized after fabricated.

ROBERTSON CHAIN LINK GATES are heavily constructed, corners fitted with malleable iron castings or electrically welded. Can be furnished in all widths, single or double style, swing or slide type.

QUALITY AND SERVICE have been the key-note to ROBERTSON'S success as fence manufacturers. Only the finest grades of steel and malleables are used. Our Engineers are available at all times to help you solve your problems, without charge or obligation. Let us submit estimates of costs and carry out the erection, if you desire.

Styles 400 and 500—sturdy, dependable enclosures in every detail



Robertson New Heavy Duty H-Beam Line Post

THE STEWART IRON WORKS COMPANY

"Fence Builders to America Since 1886" INCORPORATED

503 Stewart Block, Cincinnati, Ohio

PRODUCTS
Bronze Tablets
Chain Link Wire Fence
Flag Poles
Folding Chairs
Folding Gates

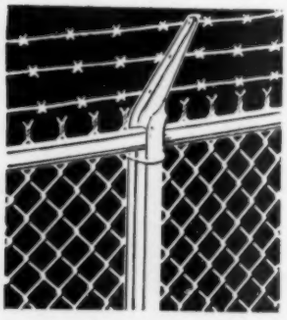
PRODUCTS
Iron Picket Fence
Pipe Railing
Settees
Stadium Seat Brackets
Window Guards—Wire Work

FOR EVERY PURPOSE

Stewart offers a complete line of Iron Picket and Chain Link Wire Fences and Gates to meet any school fence requirement whether it be for front or rear lines, athletic field or tennis court.

SALES AND ERECTION SERVICE

Stewart distributors in all principal cities together with competent erection crews, afford our customers a convenient and economical service.



View of Stewart Beam Line Post and Top Rail as Furnished with Style "3TH"

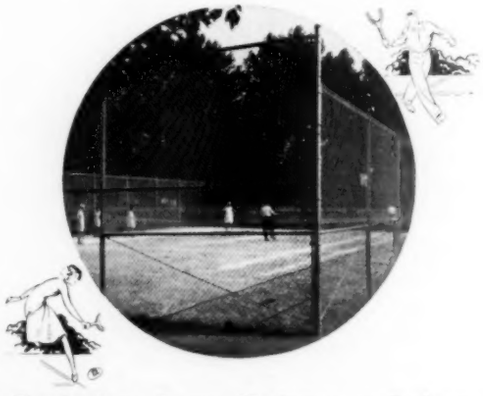
EXCLUSIVE FEATURES

Stewart Chain Link Wire Fences are distinguished by being the ONLY complete BEAM FRAMEWORK fence on the market. Long advocates of open-section Beam construction, since it is heavier and stronger than pipe, Stewart engineers have developed unique fabricating methods through its use. For example, the close-up view of Stewart Nonclimbable Fence (Style 3TH) depicts the Stewart Oval-Back I-Beam line post with integral extension arm; obviously superior to pipe or other types of posts requiring a separate pressed steel arm as so easily removed or broken. It will be noted that the beam top rail passes through the post itself—hence, the need for a fitting is obviated.

Standard heights of this style "3TH" are 7 ft. and 8 ft. overall. All materials are of Copper-Bearing Steel hot-dipped galvanized AFTER fabrication for maximum resistance to rust.

CATALOGS AND SPECIFICATIONS

In requesting literature, should your primary interest be in Chain Link Wire Fence, please ask for Catalog No. 79; if primarily interested in Iron Fence, ask for Catalog No. 76. Literature descriptive of other Stewart Specialties is available.



Stewart Tennis Court Fences (Enclosures or Backstops Only) Are Available in 8 Ft.; 10 Ft.; and 12 Ft. Heights. Prices and Full Details Upon Request

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For front line protection where dignity as well as protection is sought, the Iron Picket Fence will always reign supreme. Stewart offers a multiplicity of designs—from the plainest to the highly ornate.

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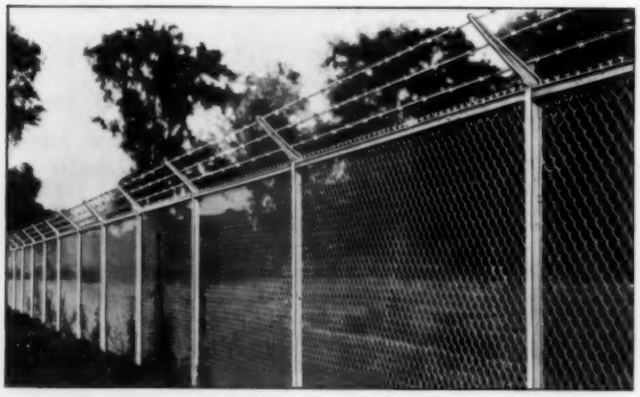


Typical Stewart School Installation, Vincennes, Indiana

Typical Stewart School Installation, Cleveland, Ohio

SECTION VI
PHYSICAL EDUCATION AND ATHLETICS

THE COMBINED AUDITORIUM-GYMNASIUM

The Jekyll-and-Hyde of the School Building

By ALICE BARROWS

Specialist in School Building Problems, Office of Education, Department of the Interior

I HAVE never known a school superintendent or principal who did not agree that a combined auditorium-gymnasium is unsatisfactory for use either as an auditorium or as a gymnasium.

It is obvious that the construction and equipment necessary for a good gymnasium—a large oblong room with a level floor, high windows with wire netting over them, no hangings, glazed tile along the lower part of the wall, no stage and no chairs, and basketball baskets prominently exposed at each end of the room—are not conducive to the successful carrying-on of activities that require good acoustical qualities, a well-planned stage, a sloping floor, heavy hangings at the windows, comfortable chairs screwed to the floor, and space for an orchestra. In other words, a good gymnasium is a poor auditorium, and vice versa.

An Anachronism and an Exasperation

Not only is the combined auditorium-gymnasium an anachronism from a functional standpoint; it is an exasperation from an administrative standpoint. Take the matter of chairs. Since this Jekyll-and-Hyde unit in the school building is to be a gymnasium at one time and presto! an auditorium at another, the floor must be flat and empty of furniture, but it must also be possible to fill it with chairs on short notice. But where are the three or four hundred chairs to be when they are not in use? That is a problem that has invited the ingenuity of many able architects who should never have had to tackle such a problem. Since the problem is impossible, the solutions have inevitably been unsatisfactory and a source of unending annoyance to superintendents, principals and janitors. One expedient is to shove the chairs under the stage. That means that the stage has to be so high that the people in the audience have to crane their necks to see a performance that is being given on top of this chair storeroom. Or a special storeroom has to be built adjoining the gymnasium, and this means additional cubage. All kinds of mechanical contraptions have been rigged up for hauling the chairs off the floor into the storeroom, but usually they are still laboriously shoved across the floor. In any case, the janitor has the unnecessary burden of folding up and putting away three or four hundred chairs or unfolding them and setting them up. Even after they are set up, the rows never stay straight and some chair is likely to collapse with an annoying racket during the most tense moment of the stage performance when quiet is essential.

But movable chairs in the auditorium-gymnasium are not merely a source of annoyance; they are a definite fire and panic hazard. Auditoriums, on the other hand, are required in most states to have chairs fastened to the floor so as to avoid the confusion and panic which is liable to result from attempting to get two or three hundred people out of a hall full of chairs which, in the confusion, may become actual barricades against exit.

It is clear that from the standpoints of function, administration, and safety, the separate auditorium and separate gymnasium are preferable to the combined auditorium-gymnasium. Yet the country is peppered with combined auditorium-gymnasiums in school buildings. Why?

A Comparison of Cubage

The usual explanation is that a combined auditorium-gymnasium is cheaper than a separate auditorium and separate gymnasium because it requires less cubage, and that consequently the auditorium-gymnasium is necessary even though it is so unsatisfactory.

TOTAL NUMBER OF CUBIC FEET AND NUMBER OF CUBIC FEET PER PUPIL IN SEPARATE AUDITORIUMS AND GYMNASIUMS AND IN COMBINED AUDITORIUM-GYMNASIUMS IN SCHOOLS HAVING 16 ROOMS, 20 AND 21 ROOMS, AND 33 AND 34 ROOMS RESPECTIVELY

Number of School	No. of Rooms	No. of Cubic Feet in Separate Auditoriums and Gymnasiums			No. of Cubic Feet in Combined Auditorium-Gymnasiums	Capacity of School on Basis of 40 Pupils per Room	No. of Cubic Feet per Pupil
		In Aud.	In Gym.	Total			
School No. 1	16				46,874	640	73.2
School No. 2	16	26,911	29,750	56,661		640	88.5
School No. 3	20				145,936	800	182.4
School No. 4	21	84,000	38,400	122,400		840	145.7
School No. 5	33	62,540	47,970	110,510		1,320	83.7
School No. 6	34				150,412	1,360	110.6

Table 1

Is this argument a valid one? The actual facts indicate that it is not. Apparently it is one of those assumptions that have never been critically examined. In a study of school building plans * recently conducted by the Office of Education, the cubage of combined auditorium-gymnasiums and of separate auditoriums and gymnasiums was secured for school buildings having the same number of rooms and approximately the same capacity. The results of this study showed that it was not necessarily true that combined auditorium-gymnasiums required less cubage than separate auditoriums and gymnasiums. In fact, in a number of instances the contrary was the case. For example, Table I shows that School No. 3, with 20 rooms and a capacity of 800 pupils on the basis of 40 pupils per room, had 145,936 cubic feet in the combined auditorium-gymnasium, or 182.4 cubic feet per pupil. On the other hand, in School No. 4, with 21 rooms and a separate auditorium and separate gymnasium, the total cubage in both the auditorium and the gymnasium was 122,400 cubic feet, or 145.7 cubic feet per pupil. In School No. 6, with 34 rooms, the combined auditorium-gymnasium had 150,412 cubic feet, or 110.6 cubic feet per pupil; whereas in School No. 5, with 33 rooms and a separate auditorium and two gymnasiums, the combined cubage for both the auditorium and the gymnasiums was 110,510 cubic feet, or 83.7 cubic feet per pupil.

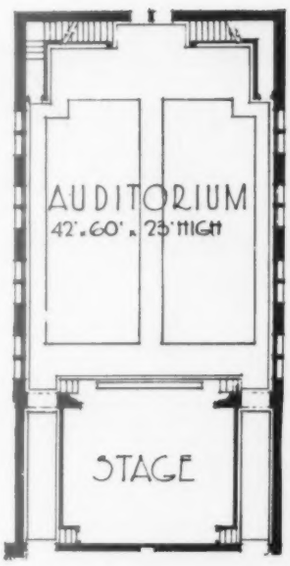
The Necessary Audience Capacity

One objection that is often made to the separate auditorium and gymnasium is that, because of the additional cubage required as contrasted with that for a combined auditorium-gymnasium, it is impossible to have a sufficiently large auditorium to take care of the needs of the school and the community. But what per cent of the capacity of the school should be provided for in the auditorium in order to meet the needs of the school and of the community? A study of both auditorium-gymnasiums and auditoriums shows that the general practice now is to provide in either the auditorium or the auditorium-gymnasium for 33 to 50 per cent of the capacity of the school, and the tendency is toward the lower figure. This does not mean that it may not be desirable to have a certain number of auditoriums in a given area with a capacity as great as or greater than the capacity of the school. For example, in cities it is often desirable to have large auditoriums in a particular high school which is the natural center for large community gatherings for an area covering three or four elementary school districts. The auditorium in the elementary schools with a capacity of 33 to 50 per cent of the total capacity of the school will then be sufficient for the school and neighborhood needs. In villages and rural areas, the capacity of the auditorium would depend upon the size and density of the population in the area to be served, but the same general plan as that just described can be followed. The main point is that it is neither necessary nor desirable for every school to provide for the total school capacity in the auditorium, and experience proves that the tendency is toward the smaller auditorium with a provision for larger ones at strategic points.

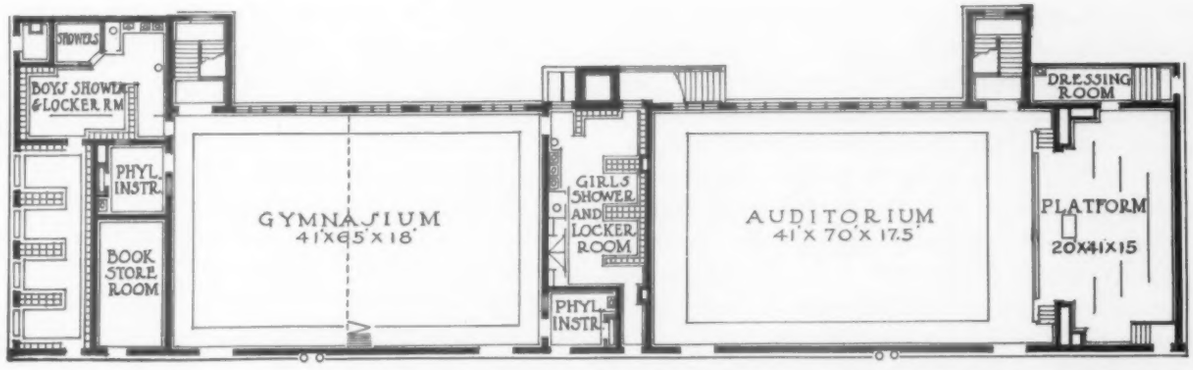
In order to discover whether the school having the separate auditorium and gymnasium provides as great audience capacity in the auditorium as in the

* See "Functional Planning of Elementary School Buildings," Office of Education, Department of the Interior, Bulletin 1936, No. 19.

School No. 3, with 20 rooms and a capacity of 800 pupils, allots 145,936 cubic feet (or 182.4 cubic feet per pupil) to an auditorium-gymnasium. The combined facilities take care of an audience of 330 pupils, or 41.3 per cent of the total school capacity

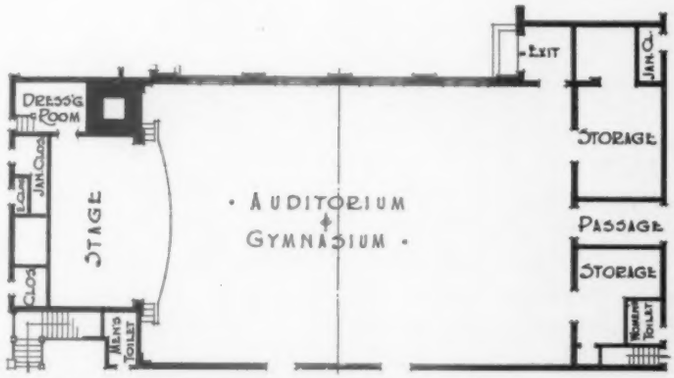


School No. 4, planned for 840 pupils, has 21 rooms and a separate auditorium and gymnasium. The total cubage of both rooms is 122,400 cubic feet, or 145.7 cubic feet per pupil. The auditorium seats 420 pupils, or 50 per cent of the total school capacity



School No. 5, with 33 rooms and a capacity of 1,320 pupils, provides separate rooms for auditorium and gymnasium use. The combined cubage of both auditorium and gymnasium is 110,510 cubic feet, or 83.7 cubic feet per pupil. 480 pupils, or 36 per cent of the total school capacity can be seated in the auditorium

School No. 6, planned for 1,360 pupils, has 34 rooms and a combined auditorium-gymnasium. The cubage of this double-duty room is 150,412 cubic feet, or 110.6 cubic feet per pupil. It has a capacity of 770, or 56.6 per cent of the total capacity of the school. Even if the audience floor of School No. 5 were increased to the dimensions of the audience floor in School No. 6, the total cubage in the auditorium and gymnasium in School No. 5 would be only 155,445 cubic feet, as against 150,412 cubic feet in the combined auditorium-gymnasium of School No. 6



EDITORIAL *Note.—The difference in scale for the floor plans of auditoriums and gymnasiums and auditorium-gymnasiums in the above schools is not shown in the reproductions. The exact dimensions are given in the tables on pages 292 and 294.*

PER CENT OF THE TOTAL CAPACITY OF THE SCHOOL BUILDING PROVIDED FOR ON THE AUDITORIUM FLOOR OF AUDITORIUM AND AUDITORIUM-GYMNASIUM

Number of School	No. of Rooms in School	Capacity of School on Basis of 40 Pupils per Room	Dimensions of Auditorium Floor	Audience Capacity of Auditorium	Per Cent of Capacity of School Provided for in Auditorium
1. (In schools having separate auditorium and gymnasium)					
School No. 2.....	16	640	35′ x 38′	220	34.0
School No. 4.....	21	840	44′ x 60′	420	50.0
School No. 5.....	33	1,320	41′ x 70′	480	36.0
2. (In schools having combined auditorium-gymnasiums ..					
School No. 1.....	16	640	30′ x 57′	280	43.9
School No. 3.....	20	800	40′ x 50′	330	41.3
School No. 6.....	34	1,360	49′ x 94′	770	56.6

Table 2

combined auditorium-gymnasium, a study was made of the audience capacity in the six schools just described. Table 2 shows that there is very little difference in the capacity of the auditorium in the separate auditorium and in the combined auditorium-gymnasium for schools of the same size. For example, in School No. 2, with a capacity of 640 pupils, the audience capacity of the separate auditorium is 220, or 34 per cent of the total capacity of the school, whereas in School No. 1, having the same total capacity of the school, the audience capacity of the auditorium-gymnasium is 280, or 43.9 per cent. On the other hand, in School No. 4, having a separate auditorium and with a total capacity of 840 pupils, the audience capacity of the auditorium is 420, or 50 per cent of the total school capacity; while in School No. 3 with a total capacity of 800 pupils, the audience capacity of the auditorium-gymnasium is 330 pupils, or 41.3 per cent of the total school capacity. In School No. 5, with a total capacity of 1,320 pupils, the audience capacity of the auditorium is 480, or 36.0 per cent of the total capacity; and in School No. 6, with a total capacity of 1,360 pupils, the audience capacity of the auditorium-gymnasium is 770, or 56.6 per cent of the total capacity. It is interesting to note that even if the audience floor of School No. 5 were increased to the dimensions of the audience floor in School No. 6, the total cubage in the auditorium and gymnasium in School No. 5 would be only 155,445 cubic feet as against 150,412 cubic feet in the combined auditorium-gymnasium of School No. 6.

Of course it is true that the cubage in the separate auditorium and gymnasium in many schools is larger than the cubage of the combined auditorium-gymnasium. For example, in a 33-room building of one of the schools included in the study of functional planning,* the cubage of the separate auditorium and gymnasium was 297,180, or 225 cubic feet per pupil, as against the 110,510 cubic feet, or 83.7 cubic feet per pupil in the separate auditorium and gymnasium of School No. 5, which had the same number of rooms. The reader can doubtless think of many examples which would seem to support the contention that the separate auditorium requires more cubage than the combined auditorium-gymnasium. The point is, however, that there seems to be no good reason why a 33-room building should require 297,180 cubic feet in its auditorium and gymnasium when 110,510 cubic feet is satisfactory.

Planning on the Basis of Use

Why should there be such great variation in the size of separate auditoriums and gymnasiums in schools of the same number of rooms and also in the size of auditorium-gymnasiums for schools of like size? There are two chief reasons: First, up to the present time there has been comparatively little scientific planning of auditoriums and gymnasiums on the basis of *use*. In the majority of schools there is no regular daily and hourly program of use of the auditorium, and consequently it is not known how many classes will be using it at one time or how often they will be using it. The tendency, therefore, is to plan the auditorium on the basis of an unverified maximum.

* See "Functional Planning of Elementary School Buildings," Office of Education, Department of the Interior, Bulletin 1936, No. 19.

Furthermore, the auditorium has often been made larger than necessary on the theory that it must be large enough for community use, but there has been no careful check, on the basis of experience, as to how large it should be for community use. The same thing holds good of the gymnasium. This practice will probably continue until educational programs are planned on the basis of a systematic use of the auditorium and gymnasium by different groups of pupils each period of the day, together with carefully worked-out estimates of the additional capacity necessary for community use.

In the second place, auditoriums, as a general rule, have not been planned on the basis of use because the legitimate activities for which an auditorium *should* be used, that is, the drama, concerts, motion pictures, discussion of current events, are not yet generally accepted as an integral part of the educational program for which time and credit should be given as much as for work in history, English, science, art, and other subjects.

The same thing is true to a less extent of the gymnasium and play activities but, on the whole, physical exercise is now generally recognized as an important part of the school program although inadequate time is still given to it in the majority of schools. For this reason, the combined auditorium-gymnasium is fairly well planned as a gymnasium with a vague hope that it may also serve as an auditorium. The fact is, however, that the school auditorium is, or should be, the little theater for the school and the community, and should have the charming, intimate atmosphere conducive to the enjoyment of good drama, fine concerts, etc. Obviously, it is impossible to have such an atmosphere in a room planned for throwing a basketball from one end of it to the other. Throwing a basketball and other kinds of play activities are important. But the activities in the auditorium are also important. At the present time they are not so considered. It is nice to wedge them in for special occasions (thereby incidentally upsetting the whole program of the school) but they do not stand on a par with academic work, art, or science, or even play. Yet the drama is one of the most ancient and beautiful of the arts. Millions of dollars are spent every year for the production and enjoyment of plays, motion pictures, concerts, lectures, etc. All these activities have a tremendous effect upon the attitudes and emotions of people. It would therefore seem reasonable that they should rank high in educational value in the school. Yet such is not the case. Lip service is given to the importance of "training for leisure," but there appears to be little realization of the fact that we can train for leisure only by developing tastes for creative and interesting use of leisure time through the formation of such habits in childhood and youth, and that such habits can be formed only through frequent and regular opportunities to see worth-while plays and motion pictures, hear good concerts, and take part in discussion of common problems. Such opportunities will be provided in the school only when a place, regular periods each day, and adequate equipment are set aside for these activities. When that is done, then the school auditorium will be planned with a view to its use, its beauty, and its economy of design.

One of the first results of such an approach to the problem will be that there will be less tendency to build auditorium-gymnasiums. If a large space for basketball is important, then provision for this activity should be made in the plans for the school, but it should not be expected that the gymnasium should serve also for auditorium activities. As has been pointed out, even with a large gymnasium it is possible to provide an auditorium accommodating 33 to 50 per cent of the capacity of the school and still not exceed the cubage of the combined auditorium-gymnasium. This does not mean that larger auditoriums will not be built, but rather that they will be strategically placed in schools that serve a large area.

Platoon Use of the Auditorium

Fortunately, there is a growing recognition in many parts of the country of the importance of auditorium activities. This is particularly true in the platoon, or work-study-play schools, where classes are scheduled to the auditorium each period of the day just as they are to other activities in the school. One day may be given to plays growing out of the work in history or literature; another day to motion pictures connected with some of the work in science or shop work; another day to lectures, debates and discussion of topics of current interest, thereby developing the habit of interest in forum discussions. Furthermore, the growing recognition of the importance of the school as a community center for adults is helping to emphasize the need of planning auditoriums as the little theaters of the community, with the result that now many schools have beautifully planned auditoriums which invite school and community activity not only because they are attractive but because they are so planned that they are an aid rather than a discouragement to the presentation of plays, concerts, etc. It is true, however, that only a beginning has been made. Rapid progress cannot be expected until the value of the work in the auditorium is recognized to the extent of providing not only a place but time for the activities of the auditorium and a dramatics or auditorium director who will give full time to this work. When that is done, we shall see real functional planning of the auditorium which will call for the combined services of teachers of art, drama, and music, architects, scenic designers, lighting and acoustical experts.

THE CONTROL AND MAINTENANCE OF COLLEGE OUTDOOR ATHLETIC FACILITIES

By EDWARD YORK BLEWETT

Assistant to the President, University of New Hampshire

THE completion of Lewis Fields, 27½-acre new outdoor recreational area at the University of New Hampshire, in the fall of 1936 raised anew the question of fixing responsibility for the proper maintenance of athletic grounds, a problem which is one of the perennial plagues of college administrators. Athletic and physical education directors seem firmly convinced that responsibility for the control and maintenance of athletic grounds and equipment should be placed in their hands. Plant and grounds superintendents are just as positive that efficiency and economy are best served by a consolidation in their departments of responsibility for the entire campus, including athletic grounds. There is much to be said in behalf of both points of view. Dr. William L. Hughes, of Teachers College, Columbia University, in several of his writings dealing with athletics and education, notes that either view may be entirely correct, depending on the prevailing situation in the institution concerned.

The Specific Problem

Given a medium-sized New England state university of 1,700 students, a department of physical education and athletics administered with direct university control, with all funds of the department handled through the university business office, with no athletic association or alumni athletic council in the picture, a limited budget and a consequent desire for economical management of the athletic plant, a comprehensive program of intercollegiate athletics fielding varsity and freshman teams in football, cross-country, basketball, hockey, baseball, track, and lacrosse, and a steadily growing comprehensive intramural athletic program, and we have the elements of the problem which pressed for solution at New Hampshire last year.

The New Hampshire campus, not including forests, nurseries, orchards, pastures, ponds, and reservoirs, comprises 154.4 acres. Before the construction of Lewis Fields, the outdoor athletic facilities included 15.2 acres, or about one-tenth of the total of the campus proper. The entire acreage, including the athletic grounds, was given the usual routine attention by the grounds crew of the University superintendent of property, including the removal of snow from the hockey rink and skating pond, out of an annual budget of $13,000. No portion of this total was ever specially allotted to the care of athletic grounds. Large-scale additions or rearrangements of sections of the grounds were handled as projects approved by the administrative committee on buildings and grounds and paid for out of a general University budget.

Lewis Fields, designed by Gavin Hadden of New York, and constructed by WPA workers under the direction of Harold W. Loveren, University Superintendent of Property, covers an area of 27.5 acres, providing six fields for football, soccer, lacrosse, etc.; four baseball diamonds (for alternate use with some of the above), one first-class quarter-mile cinder track with a 220-yard straightway and pits and runways for jumping and vaulting, fourteen composition and six clay tennis courts, and two outdoor handball courts. The cinder track in the straightway is 30 feet in width, offering eight lanes for dash and hurdles events. The major baseball diamond has bleachers of concrete seating 1,700 spectators, and two dugouts accommodating 20 players each. The football stands are also of concrete and seat 4,780 players, spectators and press representatives. Locker, shower and dressing facilities for home and visiting teams are provided under the football stands. The entire area was planned as a physical education unit. Future construction of a gymnasium with a field-house or "cage" adjoining was considered in the planning. These indoor units will be located on high ground overlooking Lewis Fields.

The athletic department has used and will continue to use other outdoor athletic equipment not provided on Lewis Fields, including a ski jump, a board running track for winter practice, a large hockey rink, a medium-sized pond for skating in winter and swimming in summer, and five composition tennis courts located in rear of the men's dormitories.

Although dissatisfaction with the centralized control of the maintenance of University grounds, including athletic field equipment, had been periodically recorded, the completion of Lewis Fields forced the issue.

A practice field is shown in the foreground. Beyond are the varsity baseball diamond and the bleachers

In the foreground is the west end of the varsity football practice field, in the middle distance the outdoor handball courts (under construction), and beyond, fourteen composition tennis courts

View showing the varsity baseball diamond and bleachers, and beyond the varsity football field, cinder track and stadium, with the outdoor handball courts and tennis courts in the background. Practice football and baseball fields are located to the left of the baseball diamond, varsity football field and tennis courts

Experience of Other Institutions

Information concerning the experience of sister institutions in New England was solicited. The variety of systems employed in the colleges and universities which responded to the appeal for assistance afforded little that was helpful in suggesting a solution of the local problem. The replies did serve, however, to substantiate Doctor Hughes's opinion concerning the wisdom of establishing systems of control and maintenance best adapted to local conditions.

A summary of the replies received follows:

College A—an endowed, coeducational institution of approximately 600 students:

"The care and maintenance of the field and equipment is handled entirely by the grounds and buildings campus men and carpenters. All work is done under the direction of the bursar, and the athletic association is billed for that part of the work for which it is responsible. The grounds and buildings department assumes financial responsibility for general upkeep and heavy maintenance of the field, mowing grass, minor grading, spring seeding and drainage, trimming hedges, repairing fences and grandstand, construction of new tennis courts and installation and upkeep of tennis backstops. The athletic association assumes financial responsibility for maintenance of the cinder track, upkeep of the baseball diamond and football field, construction and maintenance of weight rings and jumping pits, and rolling and marking tennis courts."

College B—a state university of approximately 1,600 students:

"A superintendent of buildings and grounds has full charge of all improvements and repairs as well as the maintenance of the entire plant, including athletic grounds. The athletic department suggests work that needs to be done, and it is accomplished by the superintendent as he can do it. No charge is made against the athletic department for the work done. A separate corporation of alumni members builds, repairs or improves the grandstand on the main playing field. The athletic department pays an annual rental to the corporation for the use of the bleachers and grandstand."

College C—a men's college of approximately 2,300 students:

"The athletic council employs six or seven men who are responsible to the director of athletics for the care of tennis courts, athletic fields, the indoor hockey rink and the gymnasium. The college buildings and grounds department cares for the mowing of lawns and assists the athletic grounds crew on other occasions without charge."

College D—a men's college of approximately 500 students:

"The buildings and grounds committee has final authority on capital expenditures on athletic fields, subject only to the governing board. Of course, the recommendations of the director of athletics are always asked for and are seriously considered. The superintendent of grounds carries out instructions of the committee on buildings and grounds. He also makes recommendations to his committee, but is never in conflict with the director of athletics when his recommendations concern athletic equipment. In so far as the expenditures from the athletic budget are concerned for current work on the athletic equipment, the athletic director draws a voucher or work order on the superintendent of grounds."

The New Provisions

After this study of the practices prevailing elsewhere in New England and a rather intensive examination of the local situation, the board of trustees of the University authorized that provisions be made for the maintenance of all athletic grounds, including Lewis Fields, as follows:

1. The establishment of a budget for athletic grounds in an amount sufficient to meet the cost of the custodial care and upkeep of athletic grounds, including the hockey rink and skating pond.

2. The assignment of this budget to the director of athletics, that officer to be responsible for disbursements therefrom.

3. The assignment of complete responsibility for the condition of the athletic grounds to the director of athletics, who may employ, if necessary, a full-time employee under the new budget, and who is authorized to draw his requisition for necessary expenditures for the care and maintenance of athletic grounds upon the superintendent, the charges to be assessed against the budget for athletic grounds.

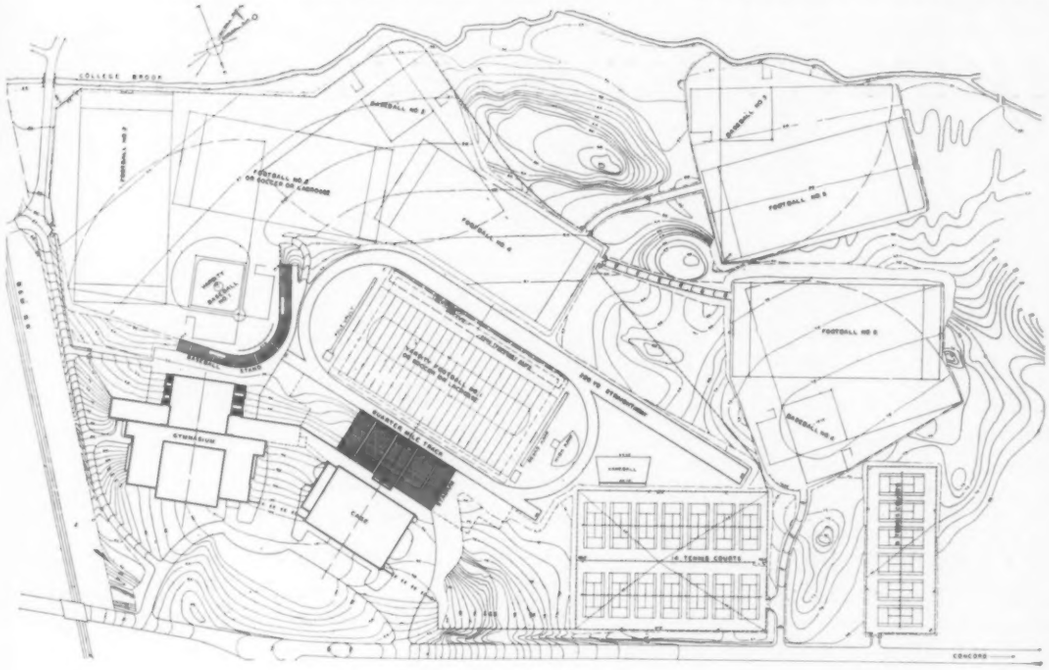
4. The superintendent of property will render the services requisitioned, making use, so far as possible, of the labor and equipment already provided in his department.

Detailed arrangements for carrying out the decision of the board included the following:

1. *Definition.*—The athletic grounds shall constitute the entire area of Lewis Fields, the ski jump, the board track, the hockey rink, the skating area, and the swimming pond, except that regulations for the use of the swimming pond are to be made jointly by the director of athletics and the director of physical education for women. The maintenance and care of the tennis courts in the vicinity of the men's and women's dormitories are to be assigned to the superintendent of property, since they are general recreational courts.

2. *Special Equipment.*—The heating, lighting, and plumbing facilities under the main football stands, and the treatment, filtration and other special equipment at the swimming pond, are to be inspected, maintained, and kept in repair by the general maintenance crew under the superintendent of property.

3. *Budget.*—A trial budget of $4,100 was established for the maintenance of the outdoor athletic grounds during the year 1937-38. This figure was arrived at after the general budget for grounds had



Layout of Lewis Fields at the University of New Hampshire. The project was completed substantially as shown. The gymnasium shown at the lower left has not been contracted for as yet. The cage is now under construction. The plan shows their position relative to the outdoor area

Gavin Hadden, New York, Recreational Designer, and Eric T. Huddleston, Durham, N. H., Architect

been broken down to indicate expenditures thereunder for the maintenance of athletic grounds, and in consideration of the estimated additional cost of maintaining the new Lewis Fields. The budget allotment is frankly experimental. It is expected that experience may indicate the necessity of a larger allotment. The budget included an item of $3,500 for labor, $450 for expendable supplies, and $150 for the purchase of miscellaneous equipment. Major repairs or additions to the athletic grounds will be effected out of a general University budget for repairs and replacements on application to the committee on buildings and grounds, as in the past.

The director of athletics distributed his budget for athletic grounds to sixteen items each covering a separate sport area, including:

1. Varsity track and field, Lewis Fields
2. Varsity-freshman weight event fields, Lewis Fields
3. Varsity football, Lewis Fields
4. Varsity football, practice field, Lewis Fields
5. Freshman football, practice field, Lewis Fields
6. Intramural contests, Lewis Fields
7. Varsity baseball, Lewis Fields
8. Freshman baseball, Lewis Fields
9. Intramural tennis and handball courts, Lewis Fields
10. Varsity tennis courts, Lewis Fields
11. Varsity-freshman cross-country course
12. Varsity-freshman hockey (one rink)
13. Recreational skating pond
14. Recreational swimming pond
15. Outdoor board running track (does not include provision for painting or major repairs)
16. Ski jump (does not include painting or major repairs)

Items of Management

It should be noted that allotments to each of the several sports areas are merely estimates within the total budget. It is conceivable that there will be variations in the cost of maintaining the individual sports areas. The director of athletics expects to build over a period of years rather definite maintenance figures covering the cost of each separate division of the athletic grounds.

Under the new plan, the director of athletics will employ a full-time supervisor who will serve as janitor of the locker quarters under the main football stands, and as general caretaker of the fields. During the winter season he will be employed in caring for the skating pond, the hockey rink, or other grounds projects for winter sports.

Twenty-four hours' notice will be given the superintendent of property by the director of athletics when extra assistance is required. If it is impossible for the superintendent to supply the necessary help within the time limit, the director of athletics will recruit student or other emergency labor wherever it can be secured.

In order to avoid unnecessary duplication of inventories of grounds tools and equipment, arrangements were made for the superintendent to assign to the director of athletics power and hand lawn-mowers with the essential attachments, sprinklers, hose, horse-drawn snow scrapers, an ice planer, field marking equipment, etc. Some of this equipment was transferred to the inventory of the athletic department, and some remained in the superintendent's inventory. All the equipment involved is to be kept in repair by the superintendent at the expense of the athletic grounds budget. Other equipment of the superintendent will be made available to the director of athletics under proper supervision for the most efficient handling of the expense of caring for athletic grounds.

SURFACING OF SPORT AND PLAY AREAS

By PERRY A. FELLOWS

Assistant Chief Engineer, Works Progress Administration

THE provision of proper surfacing of sport and play areas for schools and universities is so complicated by soil and climate conditions and by the problems imposed by local requirements, that no iron-clad rules can be laid down for the solution of any particular type of problem. Because only those familiar with local circumstances are capable of establishing a design based upon a balanced consideration of all the many factors involved, there has been no attempt on the part of the Works Progress Administration to standardize design and methods. Instead, in cooperation with schools and universities, the WPA has helped to solve the problems of each locality in a manner which takes into account local conditions and the availability of local materials.

In general, the specifications for grading, draining and surfacing established by the sponsor's engineers are not questioned by the WPA, except in cases of obvious errors or neglect. In this way the primary responsibility of the sponsors has been maintained, district and state offices of the WPA furnishing such assistance as has been possible.

Site Selection—Construction of the Surface

In the selection of a site and the preparation of the surface of athletic fields, many problems are presented, each of which must be satisfactorily solved in order to attain the best results. The selection of a site requires a consideration of accessibility, an assurance of a suitable relationship to a neighborhood, and a study of the general contours of the land surrounding the site, as well as of the site itself, in order to insure freedom from erosion or washout by floods and to facilitate the provision of adequate drainage. Provisions for artificial drainage are usually necessary, even though the site chosen be the best available for the purpose. The review of project applications has included a study of the drainage specifications, in order to avoid costly changes in design after the work has been started, or a vitiation of all the work accomplished through continued wetness of the field after a period of rain.

In the construction of the surface itself a proper consolidation of the fill must be obtained in order to avoid uneven settling, for while traps and bunkers may be highly desirable on golf courses, they are much out of place on football, soccer, and hockey fields, or baseball diamonds. Seeding and sodding are usually employed in order to maintain a suitable surface, free from dust and dirt; but such surfaces must previously be rendered uniform without an extreme consolidation of the earth, which would hinder the growth of grass and render the field unsuitable for athletic events.

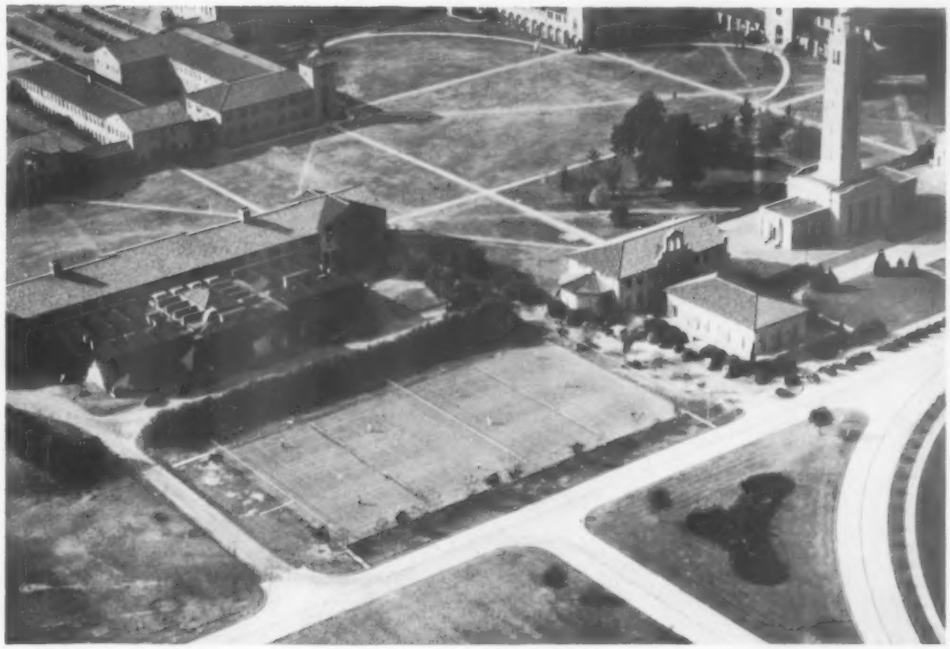
Materials Suitable for Particular Uses

Each project presents its own individual problem, but there has been a general trend throughout the country toward a standardization of types of materials for particular purposes.

On fields used for general purposes, grass has usually been accepted as the best type of surfacing. The size of the area and the number of children or adults who will make use of it determine the possibilities of utilizing grasses, or the necessity of providing a more durable type of surface.

For many special sports considerable experimentation has been necessary to find the proper materials for foundations and surfacing. For such sports, natural or prepared mixtures of sand, clay and gravel or crushed stone are commonly employed. Stabilization is often found desirable through addition of such materials as portland cement and bituminous derivatives. Play areas to be used by small children, especially those of pre-school age, must be provided with less abrasive surfaces than would be allowable for adults or older children.

In the construction of tennis courts, there has been a continuous trend from the clay type toward an asphalt or concrete surface, more often the former. Although clay has been found suitable for the surfacing of tennis courts in elementary and smaller schools, large high schools and universities have shown an increased tendency to use bituminous materials, which require less maintenance and render the courts available for use a greater percentage of the time. Asphalt types of surface include cut-back asphalt, tar, asphalt or tar emulsions mixed with slag or stone chips, hot mixed asphalt, rock asphalt (laid cold) and mixtures of sawdust and asphalt. In addition to these commoner forms of bituminous surfacings, which are often chosen because of the availability of local materials, widespread use has been made of proprietary mixtures containing a bituminous binder and a filler based on fibrous materials.



Air view of Louisiana State University tennis courts, walks and roadways—Baton Rouge

Although many sponsors prefer to use materials other than concrete for the surfacing of tennis courts, the use of concrete for handball courts has been general.

Choice of Surface in Particular Cases

The amount of rain to be expected has an important influence upon the drainage provisions and upon the porosity which can be permitted in the surface materials. The rapidity with which moisture is absorbed after a rain naturally has a bearing upon the degree of permeability which is allowable in the surface. Sport areas utilized only in the summer time naturally justify smaller expenditures to provide a continuously available surface than do those which are expected to be used a larger percentage of the time.

The presence or absence of frost during part of the year has an important bearing upon the type of base necessary for a play area, and consequently tends to determine the type of surfacing materials to be used.

The asphalt-surfaced play field at Alexander Hogg School, Fort Worth, Texas

A tennis court, or other relatively hard surface for outdoor sports in a climate where frost may be expected, should be underlain by a porous material such as cinder or gravel, with adequate provision for draining away any possible accumulation of water, in order to avoid serious damage to the surfacing through the freezing of water close to the surface.

The amount of money available for materials and for maintenance after the completion of the surface naturally has a decided effect upon the type of work which can be done. As is indicated above, the areas intended only for part-time use or for use by a limited number of people do not warrant the expenditures which can be justified where a large number of people are to benefit and the use can cover a large proportion of the time.

In many localities, surfacing materials of certain types may be available at much lower costs than others, so that economic factors are added to habit and local pride to influence a choice of surfacing which might not ordinarily be found elsewhere.

Working Techniques Used in Laying Surfaces

This phase of the work as well as the design has been largely left to sponsors' engineers, and the cooperation of WPA engineers has been limited principally to such assistance as could be given without assuming responsibility for changes in materials and methods. No attempt has been made to tabulate for the country as a whole the types of surface and the methods used.

Bituminous surfaces are constructed with thicknesses from ¾-inch to 1½ inches, depending upon the cost limitations imposed by local circumstances, and upon the physical properties and stability of the foundation course. Foundation materials include cinders, crushed rock, or brickbats laid in courses several inches thick; unstable soil conditions render it necessary at times to utilize a base course of concrete in order to provide a surface which will not warp or settle owing to the unequal resistance of the sub-base. Hot mixed asphalts used for surfacing have normally been prepared at the paving plants, which are equipped to perform the mixing in accordance with rigid specifications; many types of bituminous surfacings, however, can be prepared at the site.

For surfaces employing portland cement, methods used have followed the most recent developments in specifications and recommendations of state highway departments and other recognized authorities. For the use of proprietary materials, manufacturers' specifications have been followed, and techniques have often been suggested by engineers employed by the manufacturers to supervise the use of their materials. For other materials, the equipment locally available and the habits of local officials have largely determined the technique employed in surfacing.

WPA Experience Covers Many Problems

The athletic field of the Newtown High School, which was constructed by the WPA in cooperation with the borough of Queens in New York City, constitutes an excellent example of the diversification presented by projects of this type. A quarter-mile cinder and clay track with a 220-yard straightaway was constructed on a crushed-stone base. Within this inclosure is a combination football field and baseball diamond, provided with a tile drainage system and a 12-inch sodded layer of top-soil, as well as 16 handball courts.

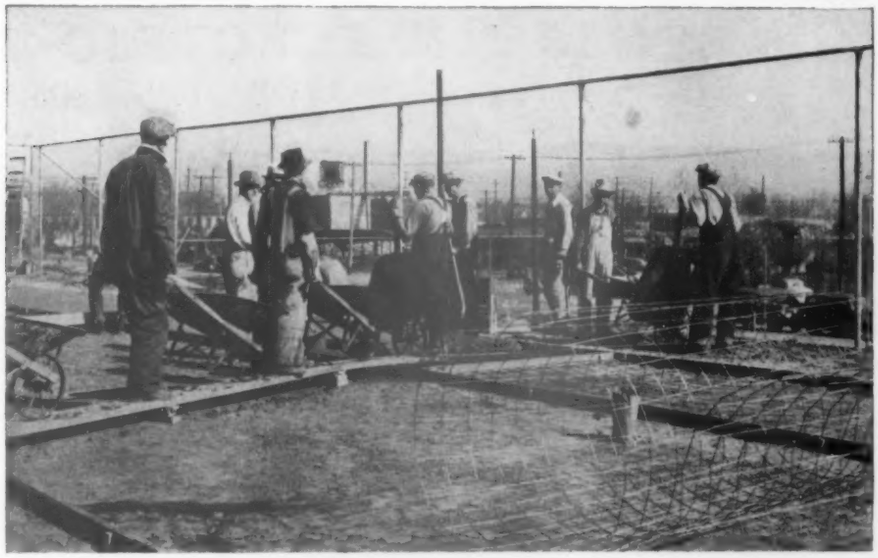
The Central High School of Trenton, N. J., which had a beautiful and commodious building without an athletic field, now has a miniature Yale Bowl constructed through the cooperation of the WPA. The construction of the field itself required the laying of nearly ½-mile of drain pipes and 12,500 cubic yards of top-soil, one-half of which was excavated and hauled to the site by the WPA. This soil was spread, rolled and seeded to form the surface of the field. The construction of the quarter-mile running track required the laying of 3,180 tons of broken stone as a base, and 551 cubic yards of cinders for surfacing. Fifteen asphalt tennis courts and numerous handball courts were also constructed within the bowl.

At the Lindbergh High School, in Union City, N. J., a new stadium was constructed on a more modest scale. The facilities for athletic events include a sixth-mile track, four clay-surfaced tennis courts, and two clay-surfaced outdoor basketball courts.

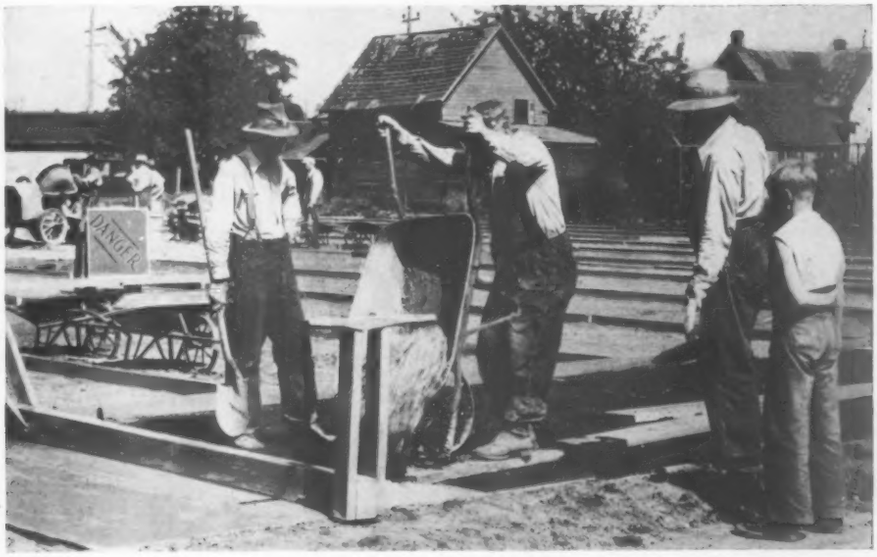
An athletic field and stadium seating 12,000 was constructed for the Cranston, R. I., High School, giving it the largest field in the state next to that of Brown University. The field was completely drained, graded and surfaced with sod.

Numerous athletic fields were either constructed or rebuilt in the state of Kansas. One at Atchison for the accommodation of all the public schools in the city is a good example of the type of work performed. A football field was drained, graded and seeded, and a 600-yard cinder and clay track was constructed on a rock base. The playgrounds of the 49 schools in Kansas City, Kans., were recoated with asphalt on a rock base to replace the former chat, the grit from which soiled the pupils' clothes, tracked into the buildings and required constant upkeep.

These are only a few scattered examples of the surfacing problems involved in athletic field construction. Space does not permit the listing of all the places in the 48 states where new construction or repairs have brought out in each individual project its own problem of surfacing.



Tennis courts under construction at the Senior High School, Yakima, Wash.



Pouring concrete for tennis courts at Chehalis, Wash.

A game of tennis in progress on one of a battery of new courts at Edwall, Wash.

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Middletown, Ohio

Durango High School Field
Durango, Colorado

REFLECTORS for gymnasiums, field houses, basketball courts, laboratories, shops, vocational departments, drafting rooms, etc.

BENJAMIN "PLAY-AREA" FLOODLIGHT

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Coaches and school authorities everywhere recognize Benjamin leadership in floodlighting for night football. In a single season alone, forty coaches reported average attendance increases of 261% on Benjamin floodlighted fields. The country over, more than 100,000 fans attend Benjamin floodlighted games yearly.

Benjamin "Play-Area" floodlights are designed particularly for the special requirements of football field floodlighting. They have the famous Benjamin "two-in-one" construction which provides the powerful forward throw of light to effectively illuminate the far side of the field. No other floodlight matches its performance, durability and the protection of players and spectators from glare.

Providing the highest quality of illumination for all outdoor sport and recreational areas, the Benjamin "Play-Area" floodlight combines a large, open-type, diffusing porcelain enameled steel reflector with an inner auxiliary projector of etched Alzak aluminum. This combination provides the two distinctly different kinds of lighting necessary for correct football field lighting.

Reflector is 28½ inches wide and 17½ inches deep; finished green porcelain enamel outside, reflecting white inside. All metal fittings are electro-plated to resist corrosion.

Designed for use with 750-1500 watt lamps and supplied with any of following styles of mounting brackets: Cross arm type for attaching to standard 4¼ inch wood cross arms; Cross arm with pipe clamp for clamping around 1 to 2 inch iron pipe and Pole Cap bracket to slip over top of 1½ or 2 inch iron pipe.

BENJAMIN "ELLIPTO-LITE" FLOODLIGHT

Cat. No. 5977

Open type floodlight of elliptical shape for floodlighting many kinds of sport and recreational areas where the exceptional lighting coverage of the "Play-Area" floodlight can be sacrificed. Combines a porcelain enamel steel reflector with an inner projector of etched Alzak aluminum. Unique, detachable hood construction makes possible the removal of reflector for cleaning. Two sizes of reflectors are available: one for 300-500 watt lamps and one for 750-1500 watt lamps. Floodlights are available with any of the following types of mounting brackets: Cross arm type for attaching to standard 4¼ inch wood cross arms; Cross arm with Pipe Clamp for clamping around 1 to 2 inch iron pipe and Pole Cap for slipping over end of 1½ or 2 inch pipe.

BENJAMIN "TENNIS COURT" REFLECTOR

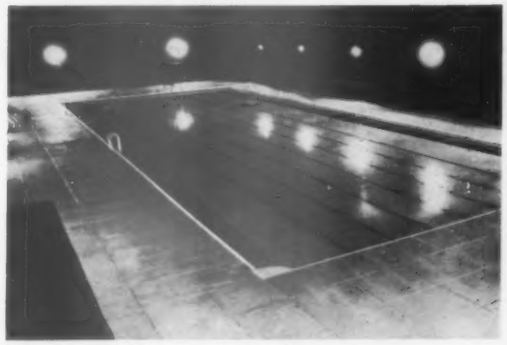
Cat. No. 4176

Benjamin "Tennis Court" reflectors are especially designed for the individual lighting requirements of tennis and provide exactly the distribution of light necessary for proper playing of this sport. Reflectors are etched Alzak aluminum and are available in either "Socket-Reflector" or patented Benjamin "Turnlox" types of construction. When used for certain locations on the court, reflectors are fitted with visors, as illustrated. Available for 750-1500 watt lamps only.

BENJAMIN "GLASSTEEL" GYMNASIUM UNITS

Cat. No. 7203

Benjamin Glassteel Diffusers are widely used for lighting gymnasiums, field houses, basketball courts, indoor tracks as well as all manner of laboratories, shops and vocational class rooms. Provide very finest quality of light which is soft and well diffused for elimination of glare and minimizing shadows. Comprise an opal glass globe in combination with a porcelain enamel reflector. Light is admitted through holes in top of reflector to ceiling to provide a cheerful appearance to room. When used to light gymnasiums and field houses, a special, heavy-duty wire guard is used to protect the glass globe from damage in case of flying balls.



Outdoor Swimming Pool

Outdoor Tennis Court

Gymnasium

Indoor Basketball Court

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A wide-beam open floodlight with porcelain-enameled reflector (Type L-45), recommended for tennis courts, parking areas, hockey and skating rinks. Rated from 300 watts to 1500 watts

Efficient Outdoor Floodlighting Offers These Benefits

INCREASED GATE RECEIPTS FROM FOOTBALL AND BASEBALL GAMES

Each year more schools and colleges are turning to night games under floodlights for increased attendance and greater income from these popular outdoor sports. Fifteen years of night sports have proved that floodlighting will accomplish these purposes. Many schools have reported attendance increases of 500% when games were played at night under floodlights rather than during the day.

ADDITIONAL PRACTICE HOURS FOR OUTDOOR ATHLETICS

Even when the floodlighting installation is not used for night games it is well worth while since it permits greater use of the playing field for practice, and almost invariably permits more students to participate in outdoor sports.

MORE INTRAMURAL SPORTS

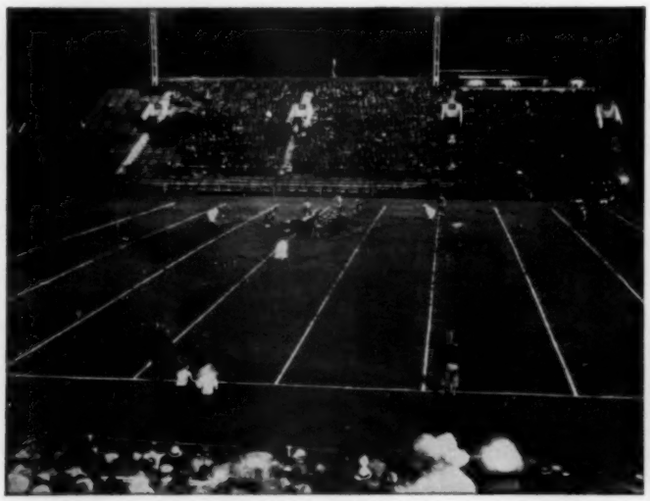
Floodlighting existing fields is equivalent to greatly increasing the number of playing fields. This increase in facilities allows more students to compete in intramural athletic competition, developing a greater feeling of good will and friendly rivalry throughout the school.

GREATER USE OF RECREATIONAL FACILITIES

Tennis courts, golf practice tees or putting greens, skating rinks, and swimming pools can be used after dark and are made more attractive by adequate floodlighting. These extra opportunities for wholesome outdoor recreation offered through floodlighting are worth many times the cost of the installation.

EMPHASIS ON OBJECTS OF HISTORICAL OR CULTURAL INTEREST

Points of interest may be attractively emphasized at night by floodlighting. This highlights things of importance and makes them more easily seen and remembered.



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Parking areas and driveways need floodlighting for the protection to persons and property.

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There is a G-E Novalux floodlight to fill your needs exactly. One which takes the right size lamp, gives

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There are twenty-five years of accumulated experience behind our lighting recommendations. General Electric engineers pioneered the very first electric floodlighting and they have been active in all phases of that art since then. Many of the initial installations in new fields have been made under the direction of our engineers, and their experience is reflected in the design of General Electric floodlights and lighting recommendations.

G-E Novalux floodlight sales and service are worldwide. The user or his contractor can obtain, through a G-E floodlight distributor or G-E sales office, the information and equipment he needs for a satisfactory floodlighting installation. Our engineering services are offered without obligation and insure that the prospective user has up-to-date information and as-

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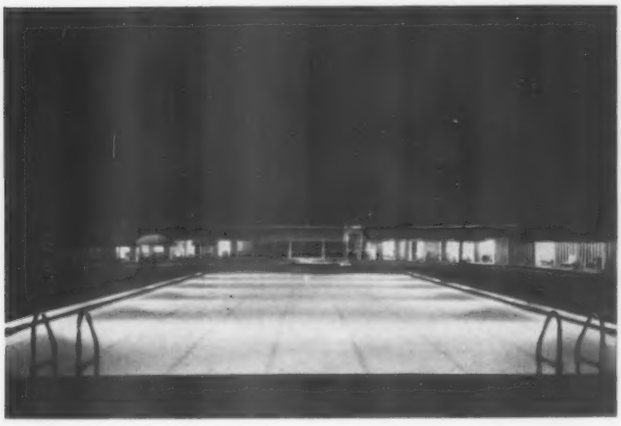
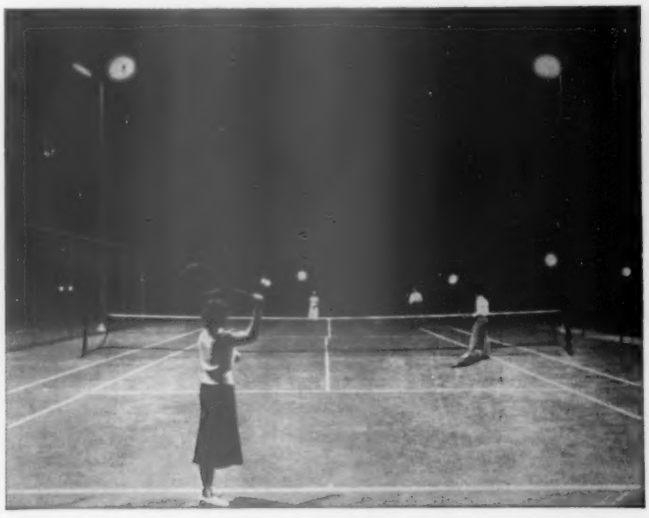
sistance in planning for a successful, economical installation. The equipment offered is always well suited for the project and is reasonably priced.

For further information, refer to our nearest Sales Office or General Electric Co., Schenectady, N. Y.



Floodlighted Swimming Pool



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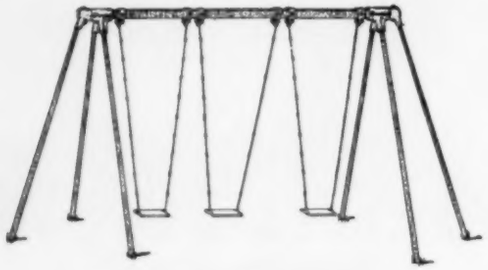

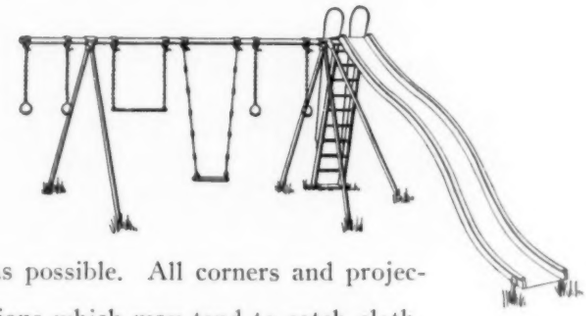

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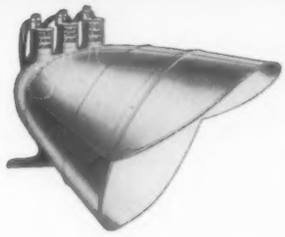

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Giant Line Markers will lay a truer line in less time than any other medium. Economical and efficient in time and material.

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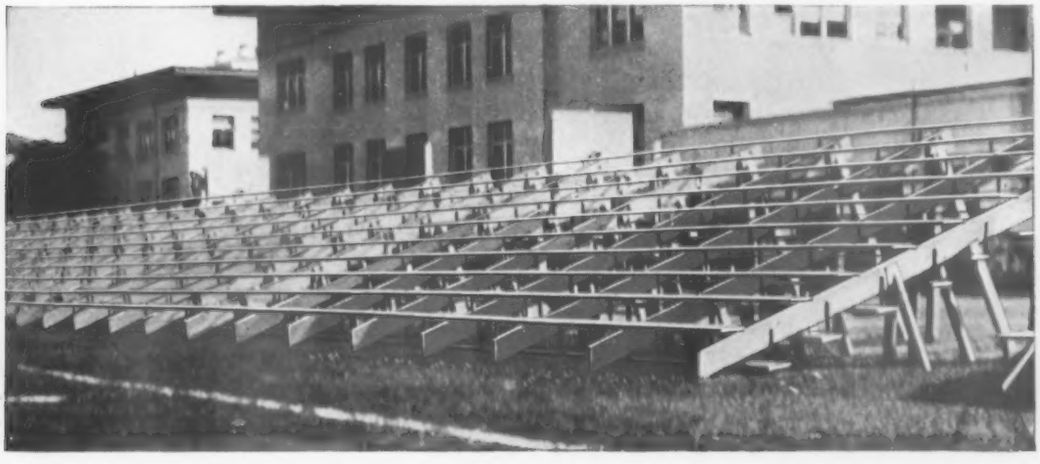

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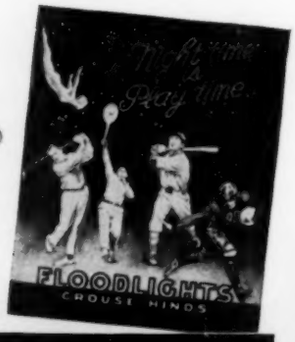
For Night Sports

Type ADE-16

Type MUA Alumalux

Bulletin 2299, entitled "Nighttime is Playtime," describes in detail the applications of Crouse-Hinds floodlights to outdoor sports lighting. A copy will be sent on request.

Type MUA Elliptalux



Night sports have been increasing in popularity year after year. Almost every sport shows greater attendance at night than during the day, and floodlighting provides increased hours for indulgence in amateur sport and recreation.

Modern illumination has made night football a most satisfactory game for both players and spectators. Lighted practice fields permit adequate hours of practice which do not interfere with class schedules.

Illuminating engineers have designed lighting systems for almost every kind of sport. Specific plans and descriptions of equipment will gladly be submitted upon receipt of detailed requests.

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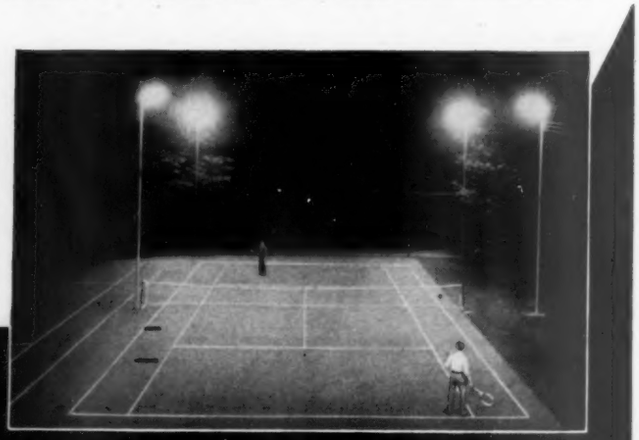
Any light distribution desired, from that of a spotlight to the widest spread floodlight, is available.



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Anderson, Indiana, U. S. A.

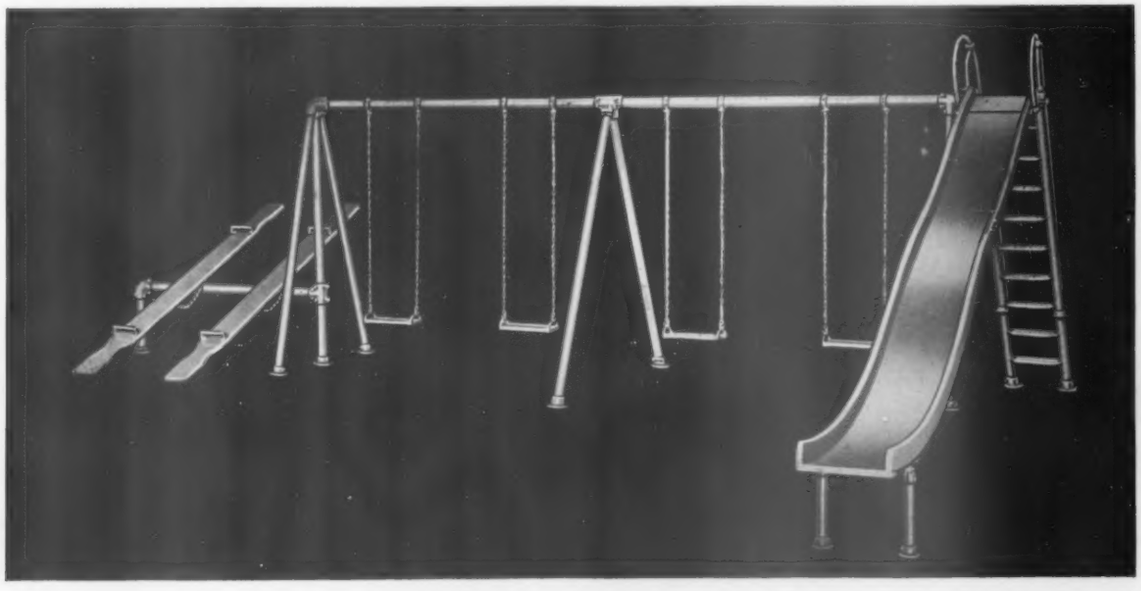
FOOT BATHS FOR ATHLETES FOOT

American Foot Baths and Hypochlorite are absolutely guaranteed to kill Athletes Foot fungi in less than 30 seconds. The only positive and sure cure that we know of for the prevention and control of this irritating ailment. **Used by hundreds of schools, colleges and swimming pools from coast to coast.**

American Foot Baths are available in round and square types in soft or hard rubber. Very economical in price and unsurpassed for performance and durability. Complete information and prices sent upon request from schools or colleges. Also complete information furnished on use of Hypochlorite. Simple and effective.

American CERTIFIED Products

AMERICAN Certified Products include **Playground Equipment, Swimming Pool Equipment, Flood Lights, Gym Mats, Official Regulation Diving Boards, Foot Baths, Corrugated Rubber Matting for floors** and **Steel Chain Link Tennis Nets.** Hundreds of schools, colleges and institutions in every section of the country use and enthusiastically endorse American Products. Write for complete information on any American product and it will be sent quickly and without obligation.



AMERICAN PLAYGROUND EQUIPMENT

American Playground Equipment has been the favorite of Schools for more than a quarter century. We unhesitatingly claim that American Playground Equipment is unsurpassed for Strength, Durability and Safety. It will OUTPERFORM all other.

Completely illustrated catalogue showing the world's finest and most complete line of playground equipment mailed upon request. **There is no obligation.**

Send for your copy today.

THE EVERWEAR MFG. CO.

35-65 S. Sycamore Street

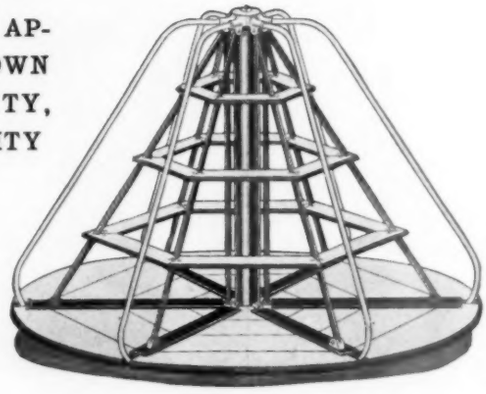
Springfield, Ohio

EverWear
PLAYGROUND APPARATUS

Playground Apparatus, Beach and Pool Equipment

EVERWEAR RECREATION APPARATUS IS WORLD KNOWN FOR SAFETY, DURABILITY, BEAUTY AND PLAYABILITY

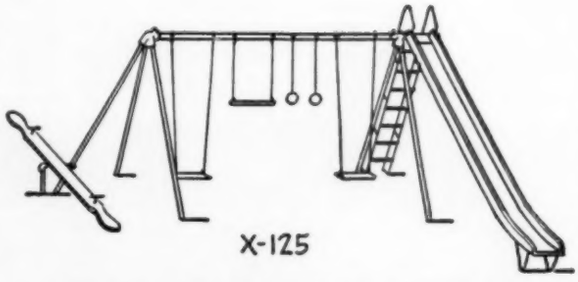
Write for Catalogs



EVERWEAR MERRY-WAVE-STRIDE

(Patented 1740304)

This is the original of this splendid outfit. Accommodates up to 15 children. The name describes its motion and suggests its uses: "Merry" for merry-go-round; "Wave" for ocean wave; "Stride" for giant stride. No. X-225 Merry-Wave-Stride.



EVERWEAR JUNIOR COMBINATION

This is the most attractive combination of play units ever arranged on one frame. It is particularly adapted for the playground where a wide variety of play functions are desired within a comparatively small area. The outfit is 8 feet high and 20 feet long. No. X-125 Junior Combination Outfit.

EVERWEAR WHIRLING CLIMB

(Patent applied for)

This exclusive Ever-Wear outfit is unique and attractive for the playground. Accommodates up to thirty children. Has a circular motion, like a merry-go-round, and the children climb all over it: the higher they climb, the closer they are to the center, which constitutes a vital factor to its safety. No. M-555 Whirling Climb.

SAFE, RUBBER

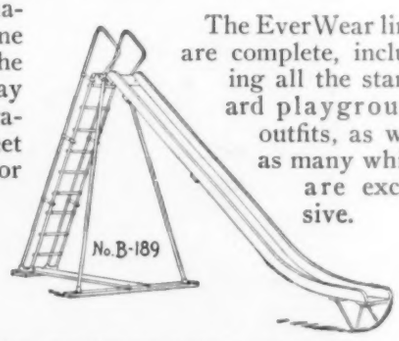
SWING SEATS

EVERWEAR SR-206 SPRING-RUBBER SAFETY SEAT FOR SWINGS

(Covered by U. S. and foreign patents)

This safe swing seat gives an element of safety to the swing which it has never had; changing an outfit classed as very dangerous, into one which can take its fine place on the playground without fear of results. "Reduced our accidents 70 per cent." Investigate them.

The EverWear lines are complete, including all the standard playground outfits, as well as many which are exclusive.



EVERWEAR PLAYGROUND SLIDES

EverWear slides, of all types and sizes, are scientifically designed to be safe; are built strong so they will endure. No. B-189, 16-foot straight slide is illustrated.

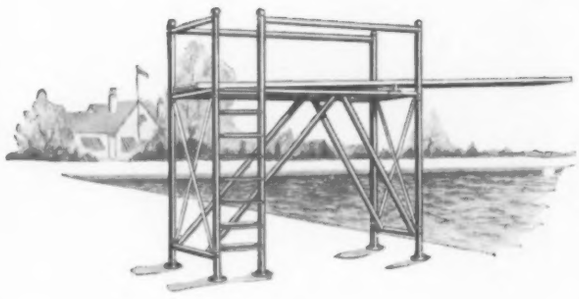
EVERWEAR STANDS WEAR AND TEAR

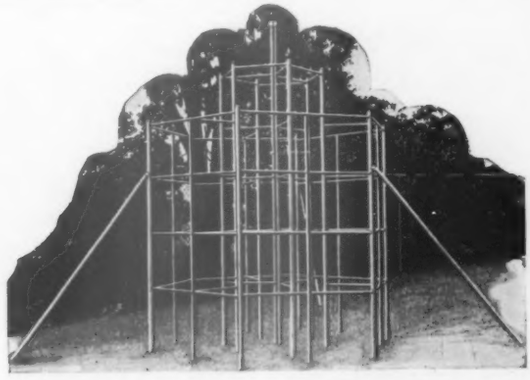
MITCHELL MANUFACTURING CO.

"Betterbilt"

Playground Apparatus and Beach and Pool Equipment

Milwaukee, Wisconsin



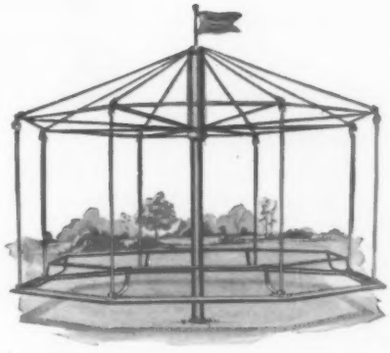


THREE METRE DIVING STAND

The tower is equipped with strong malleable iron fittings of the plug type, giving a very neat appearance which is so essential to modern pool equipment. No threads in any piece of equipment, which assures positive rigidity. Ladder at one side of tower economizes space. Correct design of the adjustable fulcrum adds to the life of the board. Can be equipped with either one piece regulation board or laminated board.

The above diving tower is only one of many beach and swimming pool devices; diving stands of various designs, diving boards, diving towers, pool ladders, life guard chairs, water slides.

Before purchasing any beach or pool equipment give your careful consideration to the "Betterbilt" Line.



NO. 500 WHIRL

NO G-1 CLIMBING GYM

Mitchell Climbing Gyms provide muscular development of the children and also instill self-confidence, initiative and ambition. By the attachment of a standard playground slide Mitchell Climbing Gyms create a desire for all children to climb. There is never a dull or idle moment where Mitchell Climbing Gyms are installed.

Due to their compactness, they provide in a small area, more development of mind and body, as well as recreation for a greater number of children than any other device on the market today.

Mitchell Climbing Gyms are shipped in panels from factory making it only necessary to attach the corner posts to the various panels when erecting. All parts fit perfectly.

The No. 500 Mitchell Whirl will safely accommodate as many youngsters as can pile on the endless platform which remains level with the ground at all times, as it revolves and sways to and from the center mast. In spite of its unique motion it does not endanger the children that play inside the guard rail, thereby eliminating all hazards of this kind. Patented construction protects the child against crushing—a common hazard of ordinary revolving devices. Group play, so essential to character building, is provided naturally. The Whirl is made in three sizes—No. 500 Whirl, 16′ 6″ in diameter; No. 450, 14′; No. 400, 11′.

FOLD-O-LEG TABLE

For cafeterias, libraries, banquets, sewing rooms, study tables, recreation centers, kindergartens, room tables, commercial departments, and social rooms. Reduce your investment on tables by using Mitchell Fold-O-Legs. They will replace the most expensive tables now used. Made in convenient sizes. Top with either fir veneer, tempered Masonite Presdwood or linoleum.

BOOKLETS

(Illustrated)

1. Mitchell Playground Apparatus
2. Mitchell Swimming Pool Equipment
3. Mitchell Fold-O-Leg Tables
4. Complete Playground Apparatus Catalog.

THE FAIR-PLAY COMPANY

Des Moines, Iowa

MITCHELL MFG. COMPANY, Milwaukee, Wisconsin, and Hanover, Pennsylvania

---

FAIR-PLAY
Automatic Electric Timers
and
SCOREBOARDS

Designed for those who have a fine sense of fair play and a deep aversion to the ill feeling and disputes often arising in timing close games. For those who have a good sense of showmanship which makes ordinary events dramatic and thrilling.

. . . . . .

Here is a fine Electric Scoreboard and timing device that is not a contraption but a real machine. Fair-Play units were designed by the best engineers available and are made in a modern manufacturing plant.

. . . . . .

All machine parts are carefully tooled and the design of working parts simple. There are no magnets, clumsy drums or discs in Fair-Play Scoreboards. They are noted for noiseless operation, quick action, easy installation and long life.

. . . . . .

The Scoreboard and Timing Clock are compact in size and light in weight. The case is constructed of wood front and back of three-ply material, crystal-lac finish giving a metallic appearance. Not an unsightly eye-sore but an improvement to the appearance of any gymnasium.

. . . . . .

The Scoreboard is controlled by a compact control box placed on the officials' table. Easily operated and, because of reversible shaded pole induction motors, errors can be corrected instantly. The time clock is controlled by a separate control box also on the officials' table. No chance of game continuing overtime, as at end of each period vibrating horn blows automatically.

. . . . . .

Made in sizes and models priced so low that they can be purchased with only limited funds.

FAIR-PLAY Model
A patented automatic timer and electric Scoreboard

. . . . . .

Automatic timer—18 inch plate glass dial lighted from rear; loud 110 volt; horn may also be sounded at will.

Cabinet—*37″* by *37″* x 9″ deep; light in weight with heavy metallic appearing crystallac finish.

Scoring tapes—Driven by low geared reversible, induction motors. NO MAGNETS. Corrections instantly. Tapes lighted from behind.

Control boxes—Pressed steel with baked enamel finish; patented timeout clock in time control for timing timeout periods.

Quarter lights—Colored lights below horn grill indicate quarter being played.

. . . . . .

Write for complete specifications and details.

. . . . . .

Custom built boards—To meet specific requirements Submit specifications.

. . . . . .

Other Standard Models—of timers and combined timers and scoreboards to meet the budget requirements of schools of all sizes.

RECREATION EQUIPMENT CO.

Manufacturers of Play Equipment for Playgrounds, Parks, Pools and Beaches

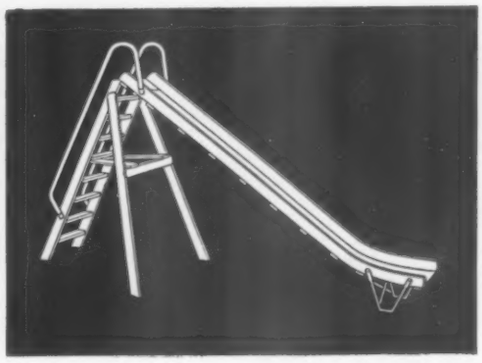
724-26 West Eighth Street, Anderson, Indiana

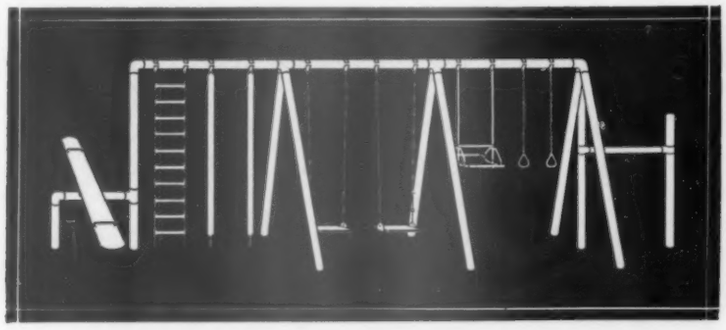
FOR THE PLAYGROUND

Slides, Swings, Merry-Go-Rounds, Ocean Waves, Gym. Combinations, See-Saws. Giant Strides, etc.

FOR THE BEACH AND POOL

Diving Board Outfits, Pool Ladders, Slides. Life Guard Chairs, Life Lines, Pool Cleaning Equipment, Diving Mask Outfits, etc.





EXPERIENCE

We offer more years of active experience in all phases of design, construction and selling, on the part of our executives, than any other company in the business. This should bear fruit in the way of better values to our customers, and increased satisfaction in service rendered.

NEWLY DESIGNED ITEMS

Many items of our production are either entirely new, or else newly designed, as a result of our wide experience.

THE RECREATION LINE

QUICK SERVICE

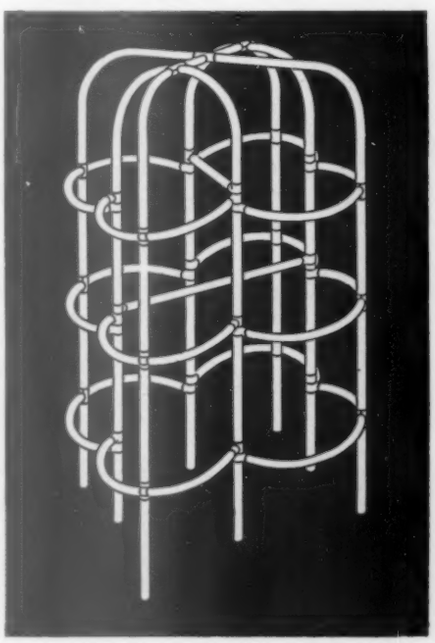
It is our boast that not more than 10% of orders received for catalog items remain unshipped twenty-four hours after receipt of order. Special orders shipped with unusual promptness.

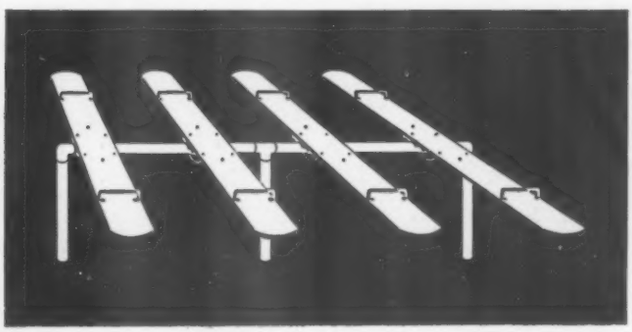
NEW CLIMBING APPARATUS

The Climbing Gym shown in the lower right corner is our smallest climbing device. However, we have recently designed what we believe is the most perfected climbing item ever produced. We call it the

MONKEY-JUNGLE

This is a large device which will accommodate 50 or 60 happy children as they climb and squirm through the maze of hot galvanized steel members, in health-building glee. Rust-proof, indestructible. Requires no attention, no upkeep. Completely described and illustrated in our new 1938 catalog.





FREE

New Catalog

Be sure to write for new free catalog. It may profit you to do so.

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 RECTOR STREET, NEW YORK, N. Y.

BRANCH SALES OFFICES

Boston	Cincinnati	Kansas City	Pittsburgh
Charlotte	Cleveland	New Orleans	St. Louis
Chicago	Detroit	New York	Syracuse
	Indianapolis	Philadelphia	

GOOD *clean* FUN

. . . That's the first rule of sportsmanship . . . of all play; good clean fun, clean air, and a good clean place to play.

But air laden with dust is not clean air, and an athletic field, a tennis court, or a baseball diamond that is thick with dust stirred up by the wind or running feet is not a clean place to play.

Solvay Calcium Chloride binds the surfaces of play areas through its compacting action. It does away with dust entirely—reduces the danger of infection through dust—cuts sunglare to a minimum—prevents surface cracking and weed growth—gives a **clean** place to play, all at a cost so low that it hardly affects the budget.

Solvay Calcium Chloride, for many years, has been used by leading schools, universities, athletic associations. It is a clean, odorless and harmless material that is easy to apply—by hand or spreader—just as it comes from the package (in small white flakes). It does not affect tennis balls, tennis shoes or other athletic equipment. Complete information will be sent upon request.

SOLVAY

TRADE MARK REG. U. S. PAT. OFF.

Calcium Chloride

TO REMOVE OR SKIDPROOF ICE . . .

Solvay Calcium Chloride spread over dangerous, slippery ice on steps and sidewalks, melts it . . . loosens it . . . skidproofs it, at a few cents an application. This treatment is the fastest, practical ice removal known.

FRED MEDART MANUFACTURING CO.

3568 Dekalb St. St. Louis, Mo.

Manufacturers of

Gymnasium Apparatus—Basketball Backstops—Telescopic Gym Seats—Playground Apparatus—Water Sports Equipment—Steel Lockers—Steel Wardrobes (The Lockerobe)—Steel Shelving

GYMNASIUM APPARATUS AND BASKETBALL BACKSTOPS

Medart Gymnasium Apparatus which is today acknowledged as the ultimate in gymnastic apparatus perfection, is the result of continuous, uninterrupted manufacture and constant improvement, since 1873. . . . Likewise the Medart line of Standard and Special Basketball Backstops has kept pace with the growing popularity of this sport. Interested parties are invited to avail themselves of the competent services of the Medart Installation Engineers.

Write for Gym Catalog G-3 and Backstop Catalog BB-2

TELESCOPIC GYM SEATS

Conservation of valuable floor space in the gymnasium is realized with the installation of Medart Gym Seats which are built around a safety-plus application of the telescopic principle. . . . Medart Gym Seats glide in and out of the "nested" position with the greatest of ease—there is nothing to lift up or to pull down. . . . Nation-wide installations attest to the unanimous approval of discriminating buyers. . . .

Write for Gym Seat Catalog GS-1

PLAYGROUND APPARATUS

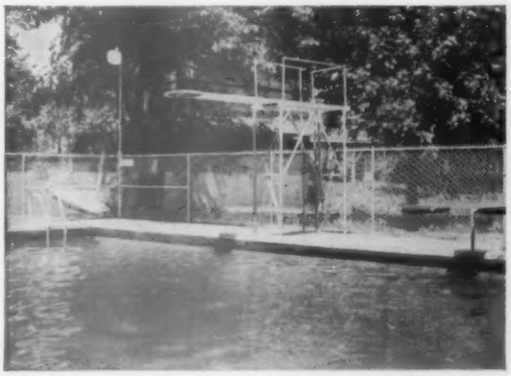
The importance of the Safety Factor in Playground Apparatus cannot be overestimated. . . . When the Medart Line was planned and developed, this all-important factor was forever foremost in the minds of Medart Engineers. . . . With safety assured, ruggedness and durability are a foregone conclusion. Let Medart Engineers help plan your playground.

Write for Playground Catalog P-3

WATER SPORTS EQUIPMENT

What the well equipped pool (indoor or outdoor) requires will be found in the Medart Water Sports Equipment Catalog. . . . Diving boards, towers, slides, ladders, etc., are fully illustrated and described. . . . A vast fund of practical installation knowledge is available to those faced with the responsibility of equipping a pool. . . . Consult with "Medart."

Write for Water Sports Catalog WS-1



Established 1909

BABCOCK-DAVIS CORPORATION

Manufacturers of Folding Semi-permanent and Permanent Grandstands

470 Dorchester Avenue, Boston, Mass.

PRODUCTS AND SERVICES

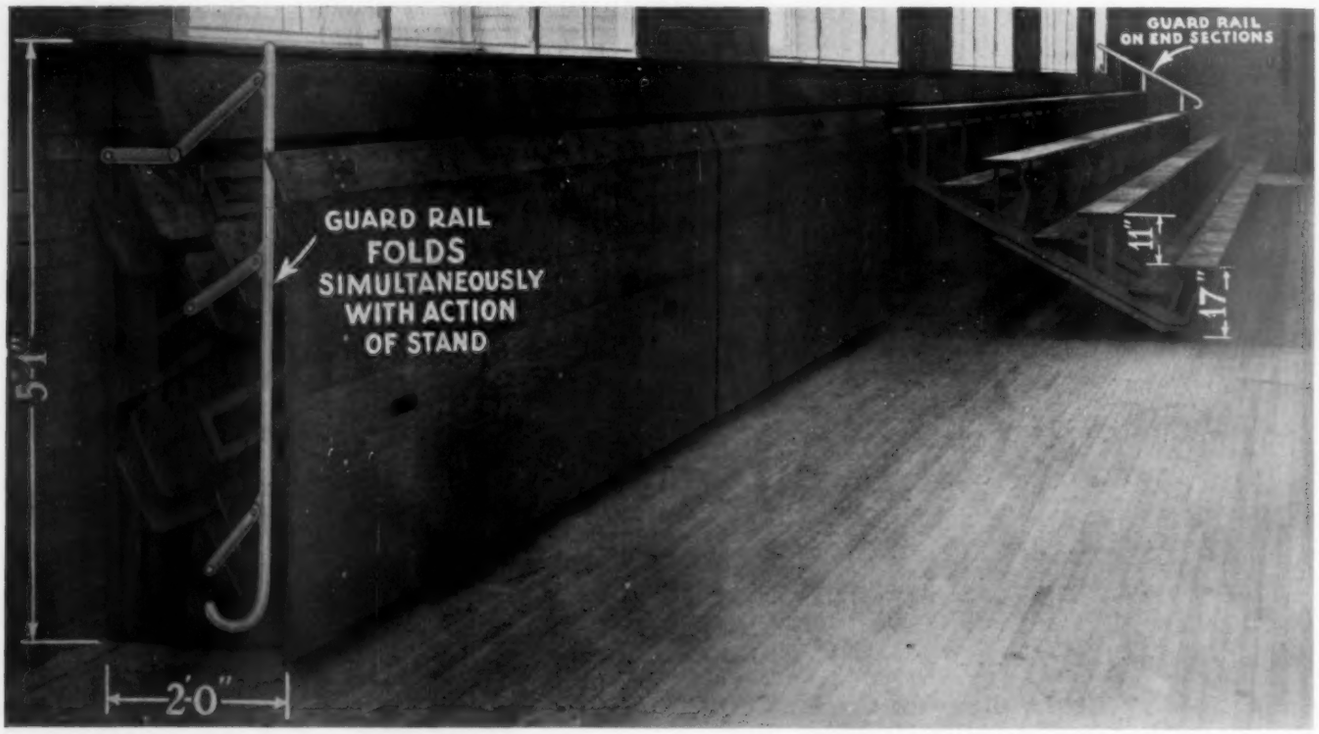
Self-balanced Gymseating.

Specialists in Motor-Operating Doors, Windows, Walls, Ceilings, Roofs, Stages, Curtains, Blackboards, and other movable parts or structures.

Our Engineering Department is always ready to furnish layouts, preliminary estimates and specifications where our equipment is to be used.

SELF-BALANCED "GYMSEATING"

(Patented)



"Gymseating" Curtis High School, St. George, Staten Island— New York City Board of Education

(Enclosure at end removed to show how compactly the seats are folded and clearance under the seats when opened)

Easily Operated

No Springs, Gears, Pulleys, Cables, Worm Screw or Drives

"Gymseating" provides for: (1) Correct vision—proper rise between seats. (2) Absolute safety to spectator and operator—automatic lock. (3) Permanent folding guard rail at open ends. (4) Self-balancing, easy to operate. (5) No rollers to damage or mark floor. (6) Panel on stand can be made to match the wainscot. (7) Panel enclosure does not touch the floor at any time. (8) When folded takes less height and floor space. (9) Easily cleaned because of ample space below stands; permits entire floor to be cleaned. No obstruction on floor. (10) Adequate circulation of air around radiators or heat units. (11) Protection against ball going behind stand. Completely enclosed.

DIMENSIONS

Size	When Open		Rise per Row, in.	When Folded	
	Height, ft. in.	Depth, ft. in.		Height, ft. in.	Depth, in.
4-row	4 2	6 7	11	4 2	24
5-row	5 1	8 4	11	5 1	24
6-row	6 0	10 4	11	6 0	24
7-row	7 1½	12 0	11	7 1½	27
8-row	7 11½	14 0	11	9 1	33½

Standard sections 10 ft. long. Distance between rows, 22 in.

A Few Installations

Lee High School, Lee, Mass.—Morris W. Maloney, Architect
Montgomery High School, Montgomery, N. Y.—Knappe & Morris, Architects
East Chester High School, Tuckahoe, N. Y.—Tooker & Marsh, Architects
Belleville High School, Belleville, N. J.—Guilbert & Betelle, Architects
La Salle Academy, New York, N. Y.—Delano & Aldrich, Architects
Eight City of New York Schools, New York Board of Buildings, Architects

"Gymseating" at Brooklyn Technical High School, Brooklyn, N. Y.

Shown supporting a load of 235 lbs. per sq. ft. Test by Testing Laboratories, Bureau of Buildings, City of New York

New York Representative: SUPERIOR SEATING COMPANY, 105 West 40th Street, New York City

JAMES H. ADAMSON

LEAVITT CORPORATION

Urbana, Ill.

(Note: We operate our own Foundry, Machine and Woodworking Shops)

LEAVITT LINES

Featuring Bleachers and Athletic Equipment

KNOCKDOWN Bleachers at Waikiki

Telescoping Bleachers at Vale, Oregon

The first shipment of KNOCKDOWN Bleachers was made in 1913. This was the first portable bleacher made in America. Beginning with the single size of 10 tier bleachers 25 years ago, we have developed and expanded this line, so we can furnish any size from 2 tiers to 40 tiers or more; either in wood or steel.

There are more than 2,500,000 seating capacity KNOCKDOWN Bleachers in use—some having been in constant use for 25 years. You will find them everywhere—all over the United States (most every major school having some in use), as well as in Puerto Rico, the Hawaiian Islands, Canada, and South America. The largest portable bleacher construction is at Soldier Field, Chicago, 52,000 capacity, and the longest at Atlantic City, four miles in length, all constructed in our plant.

The Telescoping Bleacher is the new modern, streamlined version of gymnasium seating. It operates on rubber wheels and is easily moved. Veneer or plywood materials, which are subject to mechanical injury are **not** employed in construction. It simply telescopes back against the wall, presenting a fine cabinet appearance when not in use. The rear seat is the same height when telescoped back as when fully extended.

Our book "Seating Problems" tells you all about the bleachers of above types, as well as other fixed and portable types which we manufacture.

ATHLETIC EQUIPMENT

The famous LEAVITT line of Discuses (Patent No. 1492976 owned exclusively by this company) Javelins, Vaulting Equipment, Hurdles, Shot Put, etc., have been made in our plant for 15 years.

PITTSBURGH - DES MOINES STEEL COMPANY

3425 Neville Island, Pittsburgh, Pa.
Room 994—270 Broadway, New York
1215 First National Bank Bldg., Chicago
924 Tuttle Street, Des Moines, Iowa
1224 Praetorian Bldg., Dallas, Texas
614 Rialto Bldg., San Francisco, Calif.

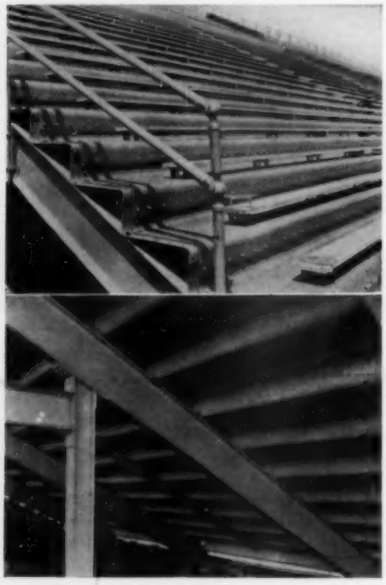
All Steel Grandstands

Patent No. 1,452,467

PITTSBURGH-DES MOINES STEEL GRANDSTANDS are used on all types of athletic fields and for indoor arenas. They are built in standard sections 18 feet long by 10 rows deep, each section seating 120 people. A stand may be any number of sections long by any number of sections deep. Its seating capacity may be increased from time to time, double decked if necessary, and no matter how often enlarged it will always present a neat and finished appearance. A roof may be provided over all or a portion of the stand.

Note the sturdy construction of the deck and supports—clearly illustrated in the two close-up views. Substantial handrails surround the stand, and may also be installed to divide it into sections.

The wood seat planks supported on cast iron or welded steel stools are securely bolted down to the deck. Other types of seats are furnished if desired. Aisles, at proper intervals, extend from front to back with walkways along the front or back if necessary. Entrance or exit is accomplished by means of stairs or ramps at the lower end of each aisle, or through wells in the stand.



The steel deck is built to shed water. Hence the space under the stands may be utilized for dressing rooms, toilet facilities, storage, etc. In a number of instances masonry walls have been built along the ends and back so as to totally enclose the space under the stands.

These stands are permanent. They do not weather, rot or decay and therefore will not weaken and collapse. Their first cost is low, and they have a high salvage value. Being assembled by means of bolts, they can be dismantled and re-erected at another location—a feature not possible with other types of construction.

Spencer, Iowa, Partially Covered Stand

Marietta College, Marietta, Ohio, Seating Capacity 4290
Masonry enclosure—ends and back

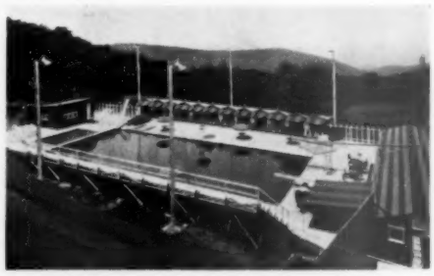
Southwest Stands—Penn State, State College, Pennsylvania, Seating Capacity 8160

An occasional coat of paint, the only maintenance necessary, keeps them looking new year after year.

Write our nearest office for "All Steel Grandstands" Bulletin No. 401, and any additional information you may desire.

All Steel Swimming Pools

Pittsburgh-Des Moines All Steel Swimming Pools represent the best value in durability, economy and appearance to be obtained. Lower in first cost than properly-constructed pools of other materials, the P·D M. All Steel Pool requires no maintenance other than a coat of paint at reasonable intervals. It is absolutely watertight; withstands frost action and ground movement without harm; is smooth, sanitary and good-looking for a lifetime. P·D M. designs, fabricates and erects steel swimming pools complete with all accessories—under a responsible guarantee of satisfaction. Send for our "All Steel Swimming Pools" Bulletin No. 402—and if you wish, a free consultation on your problem.



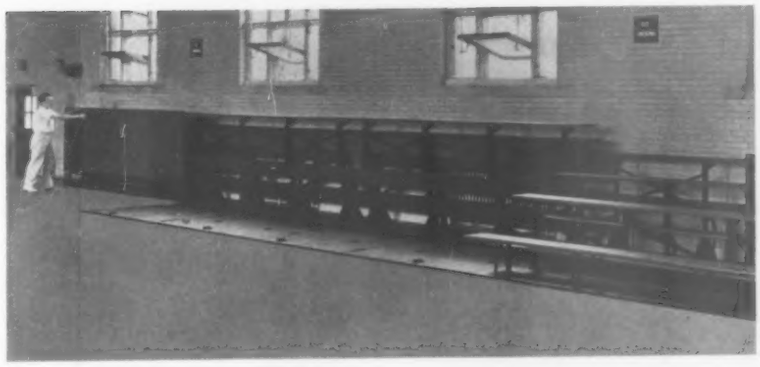
Summit Hotel, Uniontown, Pennsylvania
P·D M. All Steel Pool and Accessories

UNIVERSAL BLEACHER CO.

Manufacturers of Folding Gymnasium Stands;
Portable Bleachers and Portable Grandstands
606 So. Neil Street, Champaign, Illinois

FOLD-A-WAY GYMNASIUM STANDS

Universal Fold-A-Way gymnasium stands are designed to provide comfortable, roomy seating that may be folded away in less depth and considerably less height than similar stands. They are completely counterbalanced for one man operation. Fold-A-Way stands provide permanent seating for the gymnasium, yet may be folded out of the way in a few minutes' time and require no storage space.



Installations *

Andover, Mass. Jr. High School
Bellport, L. I. N. Y. High School
Bismarck, N. Dak. High School
Caldwell, Idaho High School
Immaculata High School, Chicago
St. Bernard School, Chicago
Y. M. C. A., Daytona Beach, Florida
Peabody High School, Pittsburgh, Pa.
Beaty Jr. High School, Warren, Pa.
Rumson, N. J. High School
Carver Jr. High School, Tulsa, Okla.
Weedsport, N. Y. High School

** Partial list of recent installations.*

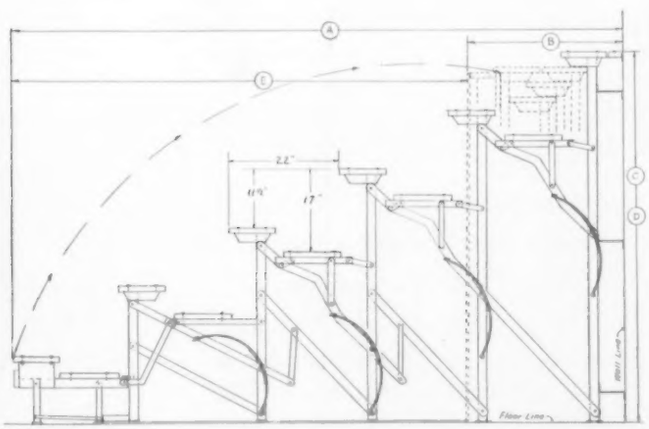
More Gymnasium Space

When the stands are folded compactly against the wall and shielded with highly finished plywood cabinets, many additional square feet of floor space are made available for physical education classes, basketball practice sessions on cross-courts and other activities requiring a larger space than that of an ordinary basketball court.

It costs quite a bit to build in stationary concrete seats that are used on an average of not more than thirty hours during the school year. The valuable floor space that these concrete seats occupy costs about five dollars per square foot and this space can be made available for other activities by installing Universal Fold-A-Way stands. This additional floor area will be used in some instances, more than a thousand class hours during the school year.

Convenient—Yet Inexpensive

In addition to providing more floor space, Universal Fold-A-Way gymnasium stands cost less to install than any other type of permanent seating. The actual cost of equipping a gymnasium with up-to-date seating is less than fifteen cents per person seating capacity per school year or less than the cost of supplying each student with lead pencils during the same period.



Covered Top

The seat boards nest together in the folded position to form a complete cover over the top of the stand which prevents basketballs, handballs and other objects of this kind from becoming lodged back of the stand. Heretofore it has been necessary to unlock and lower the stands, particularly on the larger sizes, in order to retrieve these objects. This is still necessary on some makes of folding stands unless a wire canopy is furnished at an added cost. The wire canopy will bend and twist out of shape under the force of basketballs bouncing against it.

Easy Access for Cleaning

The cabinets on Fold-A-Way stands fold separately thereby allowing complete access underneath for oiling the various moving parts and for cleaning up the paper, gum wrappers or other fire hazard that might otherwise be inadvertently left to accumulate beneath or behind the stands.

Proper and Uniform Rise Per Row

The rise per row on Fold-A-Way stands is 11½ inches which means that the sight line of one row of spectators is 11½ inches above the sight line of the row directly below them, assuring perfect vision for every spectator on every row. The rise per row is uniform for all rows and the seat spacing front to back is uniform, providing the greatest safety for the spectators when walking up and down on Fold-A-Way gymnasium stands.

Other Fold-A-Way Features

Some of the other more important improvements in folding grandstand design embodied in the Fold-A-Way stand include direct support to the floor under each row, adequate cross-bracing to take care of sway forces, easy access to radiators located behind the stands, and uniform section lengths.

TABLE OF SIZES

Rows High	A Depth Opened	B Depth Closed	C Height in Use	D Height Closed	E Space Gained
3	4′ 8″	1′ 8″	3′ 0″	3′ 0″	3′ 0″
4	6′ 6″	1′ 11½″	3′ 11½″	3′ 11½″	4′ 5½″
5	8′ 4″	2′ 3″	4′ 11″	4′ 11″	6′ 1″
6	10′ 2″	2′ 6½″	5′ 10½″	5′ 10½″	7′ 7½″
7	12′ 0″	2′ 10″	6′ 10″	6′ 10″	9′ 2″
8	13′ 10″	3′ 1″	7′ 9½″	7′ 9½″	10′ 9″
9	15′ 8″	3′ 5″	8′ 9″	8′ 9″	12′ 3″
10	17′ 6″	3′ 8″	9′ 8½″	9′ 8½″	13′ 10″

Estimates—Send us dimensions of spaces available for gymnasium stands or a floor plan together with the size playing floor to be used.

Specifications—We will gladly furnish typical specifications for use in obtaining competitive bids.

MIDLAND CHEMICAL LABORATORIES, Inc.

Dubuque, Iowa, U. S. A.

Salinas Junior College Salinas, California

MIDLAND GYMLOH

Use—On wood, or composition gymnasium floors.

Description—A special treatment for gymnasium floors containing a high percentage of Bakelite and Tung (Chinawood) oil. Acts as both a seal and finish. It is non-slippery and affords wonderful traction, will not hold rubber-burns. This finish will not peel, craze, alligator or flake and is very resistant to heat, alkali, alcohol, dilute acids, boiling water and stands excessive use. Dries to a beautiful lustre which does not darken light colored floors.

Coverage—Wood: 600 sq. ft. per gallon, one coat; 350 sq. ft. per gallon, two coats.

MIDLAND PINE DISINFECTANT

Use—For general disinfecting and deodorizing.

Description—A non-poisonous disinfectant with a base of aromatic pine oil. Miscible in either hard or soft water. This disinfectant may be used in either scrubbing or cleaning solutions and leaves the pleasing odor of pine. Pine Disinfectant has a phenol coefficient 5.5 by the F.D.A. method.

MIDLAND TILEOLEUM

Use—Excellent for cleaning tile, marble, terrazzo, slate and concrete floors—in showers, swimming pools —locker rooms, etc.

See page 228 for further information.

MIDLAND GERMOLYPTUS

Use—An all-purpose disinfectant.

Description—A non-poisonous disinfectant with a pleasant aromatic odor. Will not attack human tissue, corrode surgical instruments or permanently stain linens.

MIDLAND BASIC SURGICAL SOAP

Use—For general and dispenser use in washrooms, preparatory rooms, etc.

Description—A heavy-bodied highly concentrated liquid soap (anhydrous soap content 42%). May be substantially diluted without sacrificing efficiency.

MIDLAND SHILOH PORCELAIN CLEANER

Use—For cleaning and polishing all vitreous, porcelain, white earthenware, baked enamel, or vitreous finish china.

Description—Shiloh Porcelain Cleaner is composed of a carefully blended mixture of soft abrasive and harmless chemicals, designed to properly clean and at the same time polish the vitreous surface. Shiloh contains no ingredients harmful to vitreous surfaces.

ALSO SEE PAGE 228 FOR OTHER MIDLAND PRODUCTS

THE MATHIESON ALKALI WORKS (INC.)

60 East 42nd Street, New York, N. Y.

PLANTS
Niagara Falls, N. Y., Saltville, Va., and Lake Charles, La.

BRANCH OFFICES
Charlotte, N. C., First National Bank Building
Cincinnati, Ohio, Dixie Terminal Building
Philadelphia, Pa., Widener Building
Chicago, Ill., 410 North Michigan Avenue
Houston, Tex., Second National Bank Building
Providence, R. I., Hospital Trust Building
Washington, D. C., 1625 Eckington Place, N.E.

PRODUCTS

- **H T H (Concentrated hypochlorite)**
- **H T H-15 (Germicide)**
- **Lo-Bax**
- **Liquid Chlorine**
- **Anhydrous Ammonia**
- **Aqua Ammonia—26°**
- **PH-Plus (Fused alkali)**
- **MaFoS (Dishwashing cleanser)**

H T H

For a wide variety of sanitary purposes, particularly around the swimming pool, locker room and gymnasium, H T H is a most convenient and reliable source of available chlorine. Concentrated, H T H contains over 70% available chlorine. Moreover, it retains this high strength in warm weather and during long periods of storage.

H T H is a dry, free-flowing powder, readily soluble in water. It is shipped in cases of one dozen 3¾-lb. cans, each can containing 2½ lbs. of available chlorine.

For Swimming Pools

At thousands of swimming pools throughout the country, H T H is used to chlorinate pool water, for general disinfection of surroundings and for prevention of Athlete's Foot. A sanitation routine which provides germicidal and fungicidal protection in and around the pool is easy and economical to follow with this concentrated hypochlorite. (Write us for complete directions.)

For pool water purification, H T H can be added direct to the pool in powder form, or fed in solution form with simple, inexpensive equipment. At many pools where liquid chlorine is used for regular chlorination, a supply of H T H is kept on hand for emergency use in case of a breakdown of pumps or chlorinating equipment, or an interruption in the power supply.

To Prevent Athlete's Foot

Locker rooms, shower rooms, toilets, pool runways, etc., are undoubtedly among the worst offenders in the spread of Athlete's Foot.

Health authorities agree that the best preventive is a careful sanitary routine which includes the use of hypochlorite solutions such as those made from H T H and Lo-Bax, both in footbaths and for general disinfection of surfaces which may transmit infection. Moreover, many States now require hypochlorite footbaths at public pools.

Sterilizing and Bleaching

School laundries, like commercial laundries, find that H T H solutions are uniform and economical for bleaching and sterilizing linens, towels, uniforms and other white goods, and as a sterilizing rinse for cotton bathing suits. H T H enables them to avoid the danger of over-bleaching, which shortens the life of fabrics, and the alternate danger of inadequate protection.

OTHER MATHIESON PRODUCTS

H T H-15—An all-purpose germicide and deodorant which is ideal for use in school kitchens, dormitories, camps, etc. H T H-15 contains 15% available chlorine and is simply added direct to water by the spoonful.

Lo-Bax—A convenient chlorine carrier packed in 1¾-lb. bottles and containing 50% available chlorine. For preparing footbath solutions and for use around shower and locker rooms where limited quantities of hypochlorite are required.

PH-Plus—A fused alkali manufactured especially for restoring to swimming pool water the natural alkalinity it loses in use and during filtration. Makes pool water "feel fine."

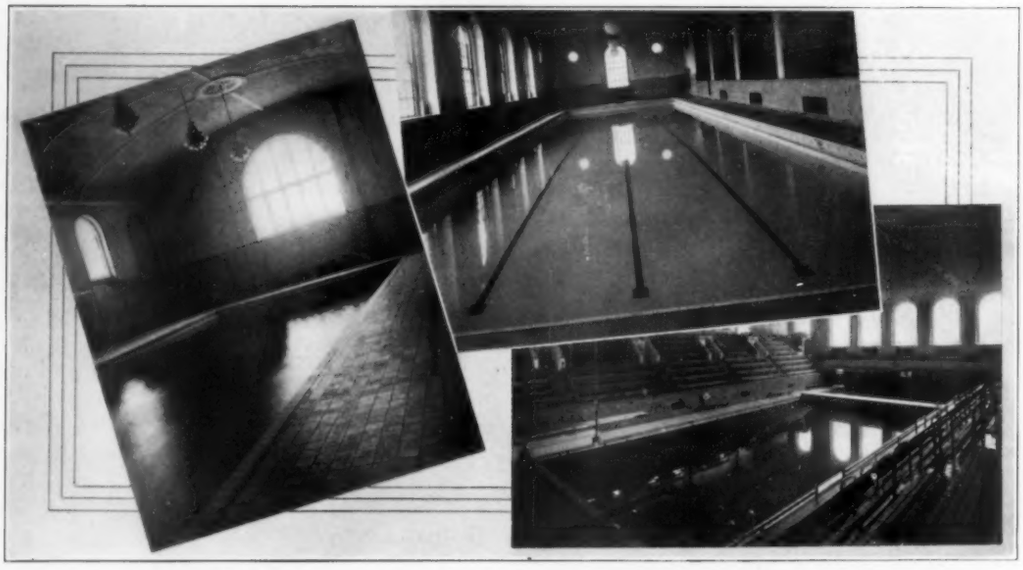
MaFoS—A new type of cleanser for dishwashing machines which comes in the form of dense, water-free briquets. Tests prove it more efficient and economical than powdered cleansers.

Swimming Pool at Public School No. 12, Troy, N. Y., Where H T H Is Used to Protect Against Athlete's Foot

THE NORWOOD ENGINEERING COMPANY

Filters for Natatoriums

Florence, Mass.



These popular pools at Dartmouth, Smith and Harvard have Norwood Filters

MANY SCHOOLS AND COLLEGES HAVE SELECTED NORWOOD FILTERS FOR THEIR SWIMMING POOLS

(Including Practically Every College in New England)

School Officials Everywhere Praise the Efficiency of Norwood Filters

ENTIRE SATISFACTION SINCE 1924

SMITH COLLEGE, NORTHAMPTON, MASS.

We are pleased to say that the filters installed by you at our Swimming Pool in 1924 have given entire satisfaction.—FRANKLIN KING, Superintendent.

DOES ITS WORK SPLENDIDLY

WORCESTER ACADEMY, WORCESTER, MASS.

The filter installed by the Norwood Engineering Company has been satisfactory and done its work splendidly.—R. J. DELEHANTY, Director of Physical Training.

Send for This

NEW CATALOG

Giving Information on

Swimming Pool Filters

A Few of the Norwood Filter Users

Agnes Scott College, Decatur, Ga.
Amherst College, Amherst, Mass.
Bristol High School, Bristol, Conn.
Dartmouth College, Hanover, N. H.
George Peabody School, Nashville, Tenn.
Hamline University, St. Paul, Minn.
Harvard University, Cambridge, Mass.
Holyoke High School, Holyoke, Mass.
Horace Mann School, New York City
Hotchkiss School, Lakeville, Conn.
International YMCA College, Springfield, Mass.
Middlesex School, Concord, Mass.
Mount Ida School, Newton, Mass.
New Sullins College, Bristol, Va.
New York Military Academy, Cornwall, N. Y.
Pasadena Military Academy, Pasadena, Calif.
Peekskill Military Academy, Peekskill, N. Y.
Phillips Academy, Andover, Mass.
Ridgefield Park School, Ridgefield Park, N. J.
Rutgers College, New Brunswick, N. J.
State Normal School, Emporia, Kans.
State Normal School, Spearfish, S. D.
University of Virginia, Charlottesville, Va.
Ward-Belmont School, Nashville, Tenn.
Wellesley College, Wellesley, Mass.
Wesleyan University, Middletown, Conn
Wethersfield Ave. School, Hartford, Conn.
Yale University, New Haven, Conn.

FREE HELP IN POOL PLANNING

Norwood engineers have been studying water filtration problems for nearly forty years. When you plan to build a new pool or make changes in a pool now in operation, our engineering department will be glad to advise you. Write for a copy of the Norwood book on Filtration and Recirculating Systems for Natatoriums.

PENNSYLVANIA SALT MANUFACTURING CO.

ESTABLISHED 1850

Widener Bldg., Philadelphia, Pa.

New York Chicago St. Louis Pittsburgh Tacoma Wyandotte

Swimming pool sanitation.... You'll save and play safe with

Perchloron

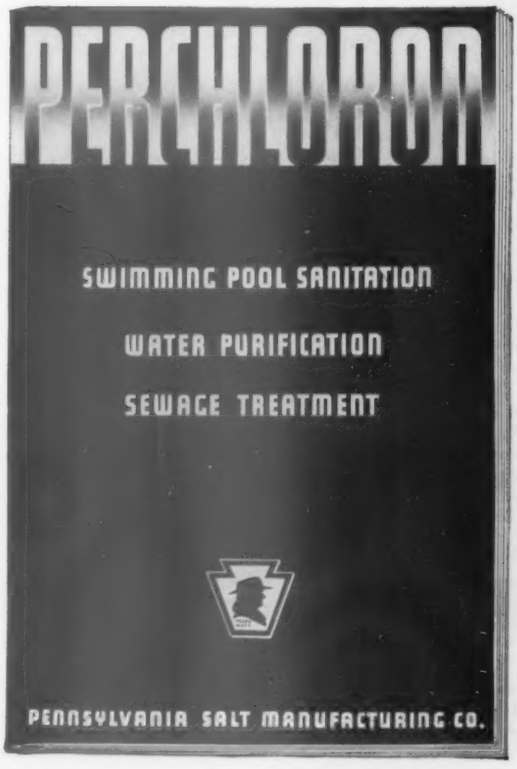
PERCHLORON is one germicidal agent that takes care of everything around a swimming pool. You can depend on it for efficient purification and for effective germicidal action. Because it is highly concentrated and stable, you always get uniform results.

Perchloron saves money by performing other important functions as well. It helps to combat athlete's foot when used in shallow trays through which swimmers must step. It serves as a deodorizer and disinfectant in spray or powder form for locker rooms and wash rooms. It acts as a bleach and sterilizer for your towels. That is why it is becoming standard equipment with modern pools.

CHECK THESE ADVANTAGES

High available chlorine content (over 70%). Comes to you in stable, concentrated form. Dissolves quickly in water. Perfectly uniform. Packed 12 handy-sized cans to the case—no return containers to bother with. Highly economical because it keeps so well and so little goes so far.

FREE New 36-page booklet covering the many money-saving uses of Perchloron, giving the latest facts on swimming pool sanitation. Send for your free copy today.



WALLACE & TIERNAN COMPANY, INC.

Manufacturers of Chlorine and Ammonia Control Apparatus

Main Office and Factory: Newark, New Jersey

"SWIM IN DRINKING WATER"

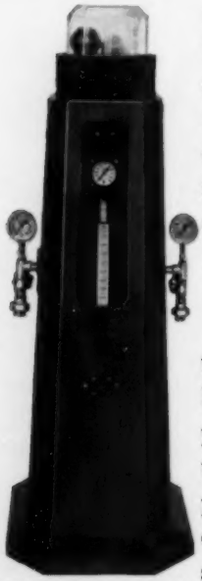
Boston, Bridgeport, Buffalo, Charlotte, Chattanooga, Chicago, Cleveland, Columbus, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Knoxville, Lexington, Los Angeles, Madison, Minneapolis, Oklahoma City, Philadelphia, Pittsburgh, Roanoke, San Francisco, Seattle, St. Louis, Syracuse, Washington, D. C.

Wallace & Tiernan, Ltd., Toronto, Canada
Wallace & Tiernan, Ltd., Winnipeg, Canada
Wallace & Tiernan, Ltd., Montreal, Canada
Wallace & Tiernan, Ltd., London, England

With the school swimming pool firmly established as a part of the physical training program, efficient sterilization is necessarily important. School executives can do no better than to follow advice given in the Report of the Joint Committee of the American Public Health Association and the Conference of State Sanitary Engineers. This report, in part, states: "From all available information, the addition of chlorine either as a gas or water solution by use of proper apparatus is today the most satisfactory method of pool disinfection." Chlorine alone gives the residual penetrating action for the complete protection of bathers at every point in the pool. More than 4000 swimming pools in the United States today rely on W&T chlorinators for positive disinfection.

"Swim in Drinking Water"

W&T Type MSE Chlorinator—For the majority of indoor pools and smaller outdoor pools, where chlorine requirements are less than twelve pounds per day, this type apparatus is most suitable. With a feed range sufficiently wide to include all changes in bathing load or recirculation rate, it is accurate and dependable in operation and may be safely entrusted to non-technical help.



W&T Type MSE Chlorinator for the Sterilization of Average Sized Swimming Pools

W&T Type MSV Chlorinator is the efficient sterilizer for large pools, having heavy bathing loads. Simplified design and sturdy construction have combined to make unusual performance records for this type of chlorinator. Of more than 5000 installed since the first went into service fifteen years ago, not a single machine has ever worn out. A survey of repair costs indicates average annual maintenance charges do not exceed one per cent of the initial investment.

W&T Ammoniator — Used with a W&T Chlorinator for the additional advantages of chlorine-ammonia treatment. Particularly in large outdoor pools where heavy bathing loads occur, chlorine-ammonia treatment improves operation by maintaining effective sterilizing action throughout the pool without complaints of tastes or odors. Additional advantages are found in improved algæ control in filters and on pool walls. W&T Ammoniators embody the same rigid production standards and excellence of material as W&T Chlorinators, differing only in the special materials required for handling ammonia.

W&T Ammoniator Used with a W&T Chlorinator to Produce Chloramine

W&T Chlorine Comparator—Swimming pool chlorination can only be controlled accurately, economically and safely when regular use of the orthotolidin test is made. The W&T Hellige Chlorine Comparator meets all requirements for a rugged, portable, accurate testing outfit. Its operation is so simple that accurate determinations of residual chlorine require only a moment's time and no specialized knowledge.

At Your Service—A W&T nationwide staff of skilled water purification experts are prepared to offer recommendations on any problems of swimming pool sterilization. The continued satisfactory operation of W&T equipment is their direct responsibility.

Current literature on swimming pool sanitation and W&T equipment is available on request.

SECTION VII
CLASSROOM—LIBRARY—AUDITORIUM

THE SCHOOLROOM AND ITS EQUIPMENT

Planning in Terms of the Educational Program

By WILLARD W. BEATTY

Ex-President, Progressive Education Association; Director of Education, Office of Indian Affairs, Washington, D. C.

SCHOOLS are changing rapidly. The moment educational leaders began to study children instead of devoting their time to the allocation of subject matter to grade divisions, changes were inevitable. Long after Locke's theory of the tabula rasa had ceased to influence psychological thinking, the men who developed our curricula and designed our school buildings were still subconsciously influenced by the naive idea that almost anything could be taught to children if you kept them still long enough. Classrooms continued to be built as rectangular boxes, walls lined with blackboards, and seats screwed to the floor in ordered rows. "Pouring in" and "regurgitation" constituted the primary techniques of teaching.

As we have begun to realize that wants, needs, and interests serve as accelerants to the learning process, we have recognized a need for change in the physical environment of the school. Purposeful activity on the part of children, as well as adults, is now recognized as a major factor in arousing wants, needs, and interests. Teachers are discovering that if situations can be created in a child's experience that lead him to desire certain skills, he acquires the skills not only more rapidly but more thoroughly. That bugaboo of all teachers, the loss of skill through forgetting, is greatly minimized when the thing which the child learns is something which he feels the need to know.

Modern teachers are learning that a skillful control of the child's environment within the classroom greatly improves the efficiency of the learning process. Conditions can be created which arouse in children the desire to do things which require skills which they do not yet possess. Under such circumstances, as pupil activity continues, there exists a continuing motivation for organized learning. This new approach to learning, while not wholly dependent on the physical environment of the classroom, may be greatly facilitated in a well-planned room with well-designed furniture where thought has been given to the part these factors may play in stimulating or contributing to constructive pupil activity.

The architectural design of the room is an important factor. While most school architects have learned that adequate light must be provided, and from one side of the room only, there are many who still persist in selecting an exterior design which requires heavy mullions between small groups of windows that minimize light and on cloudy days are bound to produce cross-shadows. A school building should be recognized clearly for what it is, and its architectural design should frankly express its needs and purposes.

Movable, Individual Furniture

It is now generally agreed that movable furniture properly designed may be a great asset to the newer type of program. While the very fact of flexibility makes almost any type of movable furniture superior to any type of fixed furniture, other factors than mere ability to move aside the furniture and obtain a clear floor space should be considered.

Out of a great many years of experience, individual tables and chairs are strongly recommended as the most desirable type of equipment. The table should be flat-topped, sturdily supported by four legs, and built either of wood or with metal supports. For the lower grades, ink-well holes are unnecessary, and in the upper grades they may frequently be dispensed with. A pencil groove is a convenience. The top should have corners only slightly rounded, if at all, and there should be no ridges at the edges. If any other means can be found for storing the child's individual equipment, the table is best without a book storage box.

Views of the same classroom, showing that the activity program makes it necessary to have movable furniture and plenty of floor space

Lightness and durability are to be strongly recommended for both chair and table. If the furniture is movable, the child will have to move it, and it should be easy for him to handle and strong enough to stand handling. Because of the variation in the size of the children, it is desirable to have furniture of varying heights available, and each desk and chair should be chosen to fit the child. There are times when chairs are of greater importance than tables for various types of reading and discussion circles and audience situations. This fact should rule out the attached chair and table combination.

There are times when large horizontal surfaces are desirable for painting, for displays, for small conference groups, and similar purposes. A group of four to six, or more, small tables with flat tops and of equal height will serve these purposes admirably. In many modern classrooms, where emphasis is being placed upon free reading periods, a larger reading table is believed to be a desirable piece of furniture. In designing room space, or ordering furniture, it is always well to realize that the most effective units should be capable of serving more than one purpose, and each unit should be considered in these terms.

Blackboards—Display Boards—Lockers

For elementary schoolrooms, 15 feet of 3-foot, 6-inch blackboard across the front of the room will serve all necessary purposes. This may with advantage be flanked with cork board, and carry a strip of cork board above it for the display of pupils' work and material of interest in connection with projects under consideration. The entire wall opposite the windows should be given over to a cork-board area from 4 to 5 feet high. If this begins about 2½ feet from the floor, it will serve as an excellent easel for art work when it is not being used as a display board for a variety of purposes.

A series of built-in lockers along this wall and below the cork board will make desirable storage space for individual pupils. Such individual storage space should be at least 12 x 12 x 18 inches in its all-over dimensions. The lockers should be two tiers high, and the top adequately finished in spar varnish. Children then may stand upon it while using the cork board above. If each vertical pair of such locker units can be closed by a door, the materials inside can be kept in much cleaner condition.

If the reading corner is placed in the rear of the room, it is desirable that a bookcase be built into the adjoining wall, with its shelves of a height easily reached by the child. Lockers similar to those recommended for the side wall can well be extended along the rear wall.

Floor Space—Workrooms

The older schools were very prodigal of floor area; possibly because building construction was less expensive then than now; possibly because more children were enrolled in a given class than is considered desirable today. Our best practice appears to indicate that approximately 30 children constitute an optimum number for a single teacher to handle, but the modern activity program makes it desirable that each individual classroom offer more floor space than for a time was considered acceptable for this number of children. The minimum area of classes of this size should be 22 x 30 feet, and an additional 6 feet of length is most desirable. Wherever possible, an adjoining workroom of the same depth as the classroom, 22 feet, and from 8 to 10 feet wide, can be used for coat storage and also furnish space for the noisier type of classroom activities.

Such a workroom should be equipped with a small bench for woodworking, containing one or more vises and storage space for tools. It is also desirable to

Classrooms should be designed to admit adequate light without glare. Shades that slide down in grooves ensure the real darkness necessary to the successful projection of slides and movies

Children may stand on the lockers while using the cork board as an easel, or the flat surface may be used to exhibit projects. A large reading table is a desirable piece of furniture

Large horizontal surfaces are often wanted for painting, displays, conference groups, etc. Several small tables with flat tops and of equal height serve this purpose admirably

Photographs in this article are reproduced through the courtesy of the Public Schools, Bronxville, N. Y.

The kindergarten puts out to sea

furnish such a workroom with a sink, and cold and, if possible, hot running water. Many activities which take place in a modern classroom can make profitable use of water. Cleanliness, moreover, can be more effectively enforced and made habitual where the means of keeping clean is easily at hand and under the supervision of the teacher. Many desirable learning experiences may be related to the preparation of food, especially in connection with simple cooking. Therefore, a gas or electric plate may frequently become an advantageous part of the workroom equipment. A number of electric wall plugs should, of course, be standard equipment in every classroom where electricity is available. Stereopticon lanterns, motion picture projectors, and a number of other electrical devices, may be profitably used in classroom instruction.

If a workroom is not possible, most of the equipment here consigned to the workroom should be installed in the rear portion of the classroom itself, for, while it is desirable to segregate equipment which is likely to prove noisy in use, it is better to tolerate it in the classroom than go without it.

Adequate Storage Space

Some place for the storage of supplies has been included in most schoolrooms. Unfortunately, this space has usually been rather casually designed, instead of built in terms of the supplies actually to be stored. Most modern schools use drawing paper of various sizes and colors, but sheets 22 x 28 inches are not at all unusual. Closets or cabinets should be designed so as to allow for the flat storage of such supplies. The amount of storage space to be provided should be planned in terms of departmental policies with regard to storing of equipment and supplies. If each classroom teacher is allowed to have all her supplies at the beginning of the year, a larger storage space is necessary than when the supplies are doled out from a central storeroom as needed or at monthly intervals.

Blocks and Boards for Building

In our desire to provide adequate space and equipment for modern teaching, there are times when some of us are tempted to go too far. Here and there we see built-in play houses, or work corners of various types. These presumably grow out of a desire to make children's activities as easy as possible and to set the stage for certain types of imaginative or imitative play. Equipment of this kind, however, tends to rob the child of some of the most important features of his more desirable activities. After all, much of the manipulative value of imaginative play lies in building and rebuilding, with its training in muscular coordination. What is today a kitchen may tomorrow become a ferry-boat or a bus. The reassembling of stock units into these various forms is a desirable part of the learning process. Therefore, it is far better to equip a primary room with blocks and boards which may be constantly reassembled into new forms than to build anything permanently.

After a good deal of experimentation, a hollow block built of $\frac{3}{16}$-inch lumber, either plain or plywood, appears to meet a vast number of needs. These blocks may be in several sizes which are multiples of one another. The following suggested dimensions will serve a variety of purposes: 6 x 6 x 24 inches, 6 x 12 x 12 inches, 6 x 12 x 24 inches, and a triangular block 6 x 12 x 24 inches. Slightly older children can profit by using smaller blocks. Younger children may need larger blocks, for a 6-inch side may require too skillful handling for uncoordinated muscles, in which case the smaller dimension should be 12 inches. Boards 1 x 6 inches, and 1 x 12 inches, in cross-section, and 2, 3, and 4 feet long, are a valuable adjunct to this kind of activity.

In all our planning for the modern classroom we should provide materials and opportunities for constructive activity by the children, but should studiously avoid doing things for them which they might better do for themselves.

THE CLASSROOM NEEDS GREATER ATTENTION

By EARL F. SYKES

Assistant, Department of School Administration,
Teachers College, Columbia University

IN RECENT years a great deal of thought has been devoted to making schoolhouses safer and more sanitary, and to planning new and better auditoriums, gymnasiums, cafeterias, and other special units. The classroom, however, which still remains the fundamental unit in the American school, has received comparatively little attention.

Classroom Environment and Atmosphere

Everyone recalls the old classroom with dingy walls and ceilings, every inch of available wall space covered by blackboards, dark-stained wainscoting and woodwork, dark oil-stained floors, drab desks and furniture, and dark-painted radiators. While most schools today have come a long way from such rooms, they have still far to go in providing an environment suitable for growing human beings to spend their lives in during the twelve to sixteen most formative years. It is surprising that with all we hear about the importance of environment, so little attention is given to the environment provided in our schoolrooms. We feel that we have done our duty if the rooms are reasonably clean and sanitary. We do as much for our jails and penitentiaries. In our thinking, are the schools after all just another form of penal institution? After visiting some of our schools, one often has cause to wonder.

One of the goals of modern education is to teach the student to appreciate and to desire the beautiful. What a discouraging task it is to try to achieve this goal in the environment provided by many schoolrooms. Even though most of the classrooms today are less dingy and drab than the one pictured above, still there is that monotonous sameness in every room, a deadening over-standardization and institutionalization.

Drabness, dullness, over-standardization, and ugliness are not only harmful but unnecessary. In many schools one color scheme is used throughout the entire building. One shade or color of paint costs no more than another, but the esthetic and even the physiological effect may be vastly different. Again, there is monotonous rectangularity of rooms, of seating arrangements, and of equipment. This can be overcome to some extent by the rearrangement of equipment and by the selection of certain pieces of furniture that are not rectangular in shape, such as a round table or a large floor globe.

Kindergarten, Carlson Elementary School, Fort Worth, Texas. Joseph Pelich, Architect

This kindergarten breaks away from the traditional, and many of the design features might well be carried over to classrooms for the upper grades. Classroom walls need not always be the same flat, rectangular surfaces. The equipment need not always be arranged in the same fixed rows, so commonly seen in classrooms. It is possible to plan for large clear floor spaces and to provide a type of flooring that is durable, easily cleaned and reasonably sanitary. Several desirable types of equipment are displayed, namely, window benches, round library or reading table, easels, display case, screen used in this case to support a large-print story book, small tables and chairs, and fireplaces

One of the worst features in many schools is the lack of individuality and personality in the different rooms. The schoolroom should reflect the personality, interests, and attitudes of those who live there. This is especially true during the present time when the trend is toward home-rooms, with students occupying the same home-room and having the same teacher for several years. The use of warm colors, with a bright spot here and there, can be very helpful. It is essential that the psychological effect of colors and their suitability to students of the particular age be kept in mind. The object should be to create an atmosphere in which the student will have a feeling of happiness and at the same time will absorb refinement and beauty. The study of art appreciation should be confined chiefly to a school art gallery or museum. Only those paintings and pieces of statuary which especially contribute to the desired atmosphere or which represent some current interest of the group should be used in the classroom.

A few flowers, an aquarium, and other living things can be very helpful in creating the desired environment. A schoolroom is not a crypt and should not be symbolized by the absence of all living things. The mood and character of the room should be conducive to the life that is to be lived therein. The desired atmosphere will require more attractive design, color scheme, wall treatment, lighting, and floors.

The modern educational program requires that the classroom take on the air of a laboratory or workshop offering many opportunities for adventure and for living. Children today are expected to live full and varied lives in school, and such a life becomes impossible unless the schoolroom provides a type of environment different from that sometimes found. Although provision must be made for many varying types of activities, the permanent clutter, so common in schools where an activity program is followed, must be avoided. Many teachers err in thinking that such a clutter of materials indicates that they are carrying on a modern educational program.

Murals, painted either by the students themselves or by an artist, may be helpful in creating the desired atmosphere. There is always the danger, however, that murals may become a distraction if they are permanent. They should therefore be painted on panels which are removable or which can easily be painted over.

Flexibility in the Classroom

The element of flexibility is of paramount importance in the modern classroom. Modern school buildings are so well constructed that they may serve over a long period of time. If they are to serve effectively, however, the classrooms in them must be so planned that continuous changes in teaching methods and equipment may be made possible. The classroom must be adapted to different types of instruction and of learning, carried on effectively on different days or even at different times during the same day. The old schoolroom, with its rows of fixed desks, permitted only one type of educational program, consisting chiefly of passive memorization and recitation of lessons. The old fixed seat belongs in the same category as the old-fashioned school slate, the only difference being that desks last longer than slates and are therefore harder to discard.

Hamden High School, Hamden, Conn. R. W. Foote, New Haven, Conn., Architect

Though no great departure from the traditional, this high-school classroom has a number of modern design features. It displays some of the new metal chairs and tables. A large amount of bulletin board space is provided. The floors are attractive and sanitary. The ceiling is treated with acoustic paneling. The teacher has a filing cabinet which matches her desk both in finish and in height. Fewer blackboards, more bulletin boards, plenty of artificial lighting outlets and movable equipment are essential features of modern schoolroom planning

Stationary and unadaptable equipment makes impossible the broad range of educative experiences considered desirable for the child today. There is a necessity for stimulating individual growth, for giving maximum opportunity for expression in various areas, and for active participation in many types of learning activities.

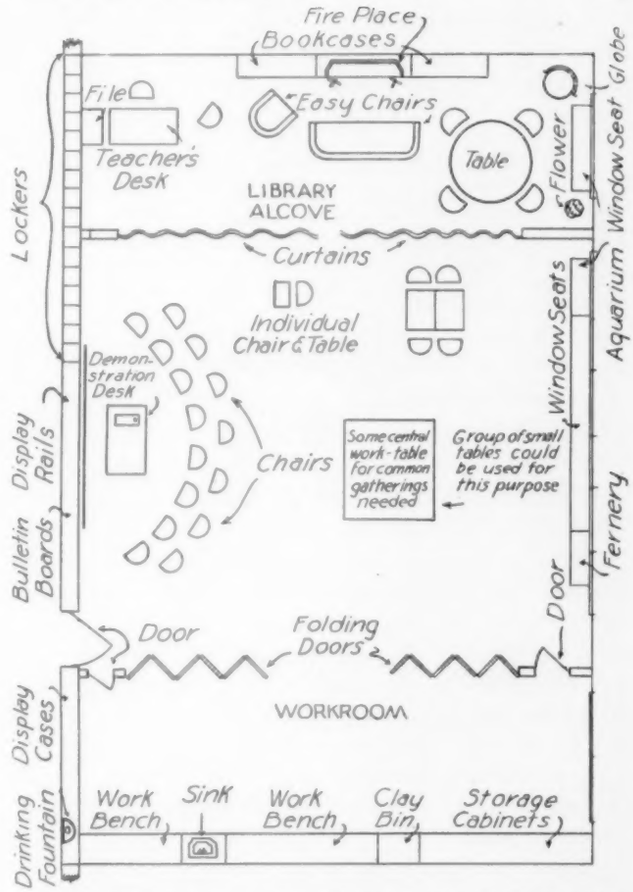
There are a number of ways in which the facilities of the classroom in both the old and the new buildings can be adapted to aid in the attainment of the objectives of the modern educational program. One of the prime necessities is the provision for maximum flexibility in use and maximum freedom of movement, ample space for demonstrations, and a wide range of individual and group activities, a number of which will frequently be going on at the same time.

Students need plenty of desk or table surface for work at certain times, clear floor space at other times, and constant changes in seating arrangement. For paper cutting and similar activities they need flat surfaces rather than slanting narrow desk tops. These requirements demand furniture which is light and easily moved. No one change in the classroom or in its equipment can do more to achieve the desired goal than the use of a flexible type of movable seating equipment.

Individual table and chair units permit the greatest degree of flexibility because of the many ways in which they can be used. They may be used as independent individual units, or the tables may be placed together to form a large table around which a group may gather for conference or for group work. The tables thus arranged may also be used for large projects. The chairs alone may be used for a story hour or a discussion circle. The table and chair units may be arranged in semi-circular formation for senate meetings, discussions and demonstrations. The chairs alone may be used when plays or pageants are staged. The floor may be cleared and the chairs arranged around the walls when the room is used for play activities, parties, and the like. Hamon,* in his study of seating equipment, found that the greatest gain in sales in recent years in school equipment has been in the table and chair type of classroom seating. His study bears out the point that teachers and administrators are becoming aware of the desirability of this particular type of equipment.

Reversible boards, with blackboard on one side and bulletin board on the other, permit multiple use of blackboard space and the conversion of classrooms into art studios. On the bulletin-board side may be fastened maps, charts, diagrams, student work, etc. Rails should be provided at the top of the boards to permit the display of maps, charts, student work, and murals.

* Hamon, Ray L.: "Trends in Types of School Seating." *Nation's Schools*, Vol. 16, pp. 57-58, September, 1935.



A sketch suggesting ways of facilitating a wide range of activities. No classroom would need both folding doors at the front and curtains at the back. An archway would set the library alcove apart and relieve rectangular monotony. Soundproof curtains would be more desirable than folding doors for cutting off the workroom, particularly if the floor were elevated for stage use

Large exhibit cases with glass fronts should be supplied either in the classroom or in the corridor. Frequently corridors are thought of merely as connecting links between classrooms, and little thought is given to their great potential value as educational space.

A demonstration desk, placed near the center of the room and equipped with a sink, running water, and possibly gas and electricity.

A library corner, alcove or quiet nook, equipped with a bank or two of bookshelves, a large globe (preferably a floor model), a round reading table (round to help break up that rectangular monotony so common in classrooms), and a few comfortable chairs, not only adds to the attractiveness of the room but makes possible a wider range of activities.

A workroom adjoining the classroom has many uses, especially when there is a large opening which may be shut off by soundproof curtains. The room is a place where small groups, carrying on some noisy type of activity, may work. The floor of the workroom may be slightly elevated, thus providing a small stage where a play, program, pageant, or dramatization of some activity or historical event may be presented.

The classroom is not complete without an adequate amount of storage space for a wide variety of supplies, equipment, materials, and finished or unfinished projects.

Acoustics of the Classroom

Much of the fatigue, exhaustion, and irritability felt by teachers and students is due either to the distracting, nerve-wracking noises so common in the classroom where a modern educational program is being carried on, or to nervous tension on the part of teachers and students as they try to prevent and avoid making noise. By noise is meant any sound that interferes with the task at hand. Such sounds affect both the highly complicated nerve structure in the ear and the entire nervous system. The infinite number of energy sound waves striking the sensory organs of the body have the same tiring effect that the sea bather experiences from the waves beating against his body as he attempts to resist their influence. Noise unquestionably reduces both the quality and the quantity of productive work. It not only interferes seriously with the efficiency of teacher and pupil, lessening their attention and making concentration difficult, but also puts a great strain on the nervous system as a result of efforts to overcome the effects of noise.

Efforts in recent years to make school buildings fireproof and more sanitary have resulted in the construction of schoolhouses made of materials which have excellent sound-reflecting qualities, the classroom walls and ceilings being of hard plaster and the floors of hardwood or composition stone. A sound generated in such a room bounces back and forth several hundred times before enough of its energy has been absorbed to make it inaudible. Sounds are actually built up in volume and retained in strength by such reflection and reverberation. The modern educational program, involving varied types of activity, many of them going on at the same time, demands acoustical treatment for the classroom.

Business organizations have found that acoustical treatment pays great economic dividends. Schools can eliminate much economic waste, at the same time contributing greatly to both teacher and student comfort, by acoustical treatment of classrooms.

By using the Sabine formula, the acoustical engineer can calculate the exact number of absorption units necessary to eliminate annoyance resulting from noise in any given room—whether it be classroom, laboratory, shop, auditorium, gymnasium, cafeteria, or swimming pool. Just as the air-conditioning engineer has found the ideal temperature for different types of rooms, so has the acoustical engineer found the amount of noise it is necessary to eliminate in order to insure harmonious working conditions in different types of rooms. The object in acoustical treatment is not to eliminate all sound in a room but rather to abate the noise and reverberation to a point where the room is sound-comfortable. This is achieved by the application of sound-absorption materials sufficient to correct the unsatisfactory effects. In most classrooms treatment of the ceilings is all that is necessary.

The application of sound-absorption materials provides an economical way to rehabilitate old and defective ceilings. The expense involved in tearing off old plaster and replacing it with new, together with the accompanying dirt and grime, may be eliminated easily and conveniently by the application of panels of sound-absorption materials directly over the defective plaster.

Such acoustical treatment lowers the sound level in the room and makes hearing and speaking much easier. Since noises come into classrooms from corridors, which because of their length and emptiness tend to serve as sounding-boxes and to accentuate every sound that occurs in them, it is advisable to apply acoustical treatment to the corridors as well as to the classrooms. Here again, treatment of the ceilings is usually all that is necessary. In certain cases, however, it may be necessary to apply acoustical treatment to the upper part of the corridor walls as well as to the ceilings.

There is no reason for tolerating the nerve-wracking conditions now existing in most classrooms, for the cost of the needed sound treatment is not unreasonable. The distinct economic loss involved in wasted teaching effort, and time spent in trying to subdue noise, alone would justify treatment of the walls and ceilings of classrooms.

Not all the improvements suggested in this article can be provided in every schoolroom at one time, except in planning a new building. However, a definite program can be developed for buildings already erected, to insure the making of certain of the desired changes each year until the complete program has been accomplished.

THE TYPEWRITER ENTERS THE ELEMENTARY CLASSROOM

By EDITH U. CONARD

Instructor in Nursery School, Kindergarten and First Grade Education, Teachers College, Columbia University; Instructor, Brooklyn College, Brooklyn, N. Y.

ALTHOUGH many educators today consider the portable typewriter valuable or even necessary for the elementary program, the average school administrator, even if himself enthusiastic over its possibilities, will have to present to his board very good reasons indeed for considering any expenditure for such unusual equipment. And if he carries his point, he will have to face a new set of administrative problems. He will certainly have to consider the question of providing suitable equipment and facilities, and in all probability it will be necessary for him to help the teachers plan for the proper use of this new teaching tool.

The Typewriter as a Teaching Aid

Experimental use of the typewriter in the elementary program has shown that the new tool is valuable for many reasons, including the following:

1. It stimulates the learning of elementary school subjects, such as English, composition, spelling, arithmetic, geography, history and social studies.

2. Because the typing movements entail less strain on immature muscles than handwriting, children can express their ideas more readily by means of the typewriter.

3. Their ability to express ideas is increased, and the level of achievement in certain school subjects is therefore raised.

4. The effect on handwriting is not detrimental, but on the contrary is positive, stimulating interest and increasing achievement in written form.

5. Both teachers and pupils approve and enjoy the opportunity offered to use the machines.

6. The use of the typewriter in ordinary elementary classroom work is entirely feasible. When used in an informal way, it has been found to help children attain an average typewriting speed about equal to the handwriting speed. Also, they can produce their work with accuracy.

Administrative Problems

What are the problems confronting the school administrator in sponsoring the use of typewriters in the elementary classroom? He is concerned not only with supervision of curriculum activities, but also with supplying equipment which is durable, suitable, and practical for use by children of various ages. First, there is the selection of typewriters, the kind and size, and marking them for identification. Also, there is the securing of the requisite number of machines and planning for their distribution. Then there is the selection of tables and chairs to meet standards of

Third-grade group using typewriters, Horace Mann School, Teachers College, Columbia University

height and size, and the question of storage space. Needless to say, there are books and other materials such as wall charts, etc., needed for proper and adequate learning. Finally, there is the necessary care and maintenance from year to year, and during the year, in order to give the fullest service possible.

Experience has shown that portable machines, made by any of the well-known manufacturers, are adaptable to classroom purposes owing to their size and weight. They are light in construction, which makes them easily handled and quickly moved. Because they are compact, they take up little space on the table or desk, which allows room for the child to place any necessary copy material beside the machine. If the child is using a table and a chair of correct height, the keyboard of the machine will be so placed that his arms will be level when striking the keys; therefore, he will develop the correct stroke for writing rather than pressing the keys too heavily. For identification, the school name should be stamped or painted on both cover and machine. Also, a record should be kept of the machine number in the school office, in order to trace any loss by theft. It is also well to place the machine number inside the lid, for children sometimes mix up the covers of their machines.

The number of machines to order per room and per a given number of children will be a problem to consider. This may depend on the type of school and the age-range of the children, the interest as well as the adaptability of the teachers, and the funds available. Lower grades can adapt a smaller number of typewriters to classroom activities, owing to the greater flexibility of their program, the shorter interest span, and less demand and need for written expression. For kindergarten, first and second grades, with enrolment of about thirty-five children, a minimum of one to three typewriters should suffice. For third and fourth grades, a minimum of four to six typewriters should be provided; and for grades above fourth, experience has shown that at least one-fourth of the class enrolled should be provided with them.

It is important in ordering typewriters for children to order those made with Roman style, or Library Gothic letters, for they are simple and easy to read. A primer size type is preferable for primary grades, since it is the same size and style as early printed book type. For sight-conservation classes, either the Library Gothic or the Bulletin type is recommended. For grades above the primary, a pica type, similar to that in readers for children, is suggested.

Unless it is otherwise specified, keyboards show capital letters. This complicates early attempts in typewriting for little children. Keyboards showing lower-case letters overcome the early difficulties of seeing the capitals on the keyboard and finding the lower-case letters on the page they write. Therefore, for kindergarten, first and second grades, it is better to order the keyboard showing lower-case letters.

There was a period when it was thought necessary to order typewriters in different colors. But since this does not affect the writing or the interest of children in the machine, few schools are going to that extra expense now. Ribbons in colors—blue, red, green—are also made, but for most purposes, in lower grades, it has been found more economical to supply only black ribbons for the machines.

Ordinarily, any small flat-top table or desk will do to use with the typewriter. The main essential is to see that the child is high enough so that his arms will be held straight or parallel with the table top. The position is similar to that of the pianist. The elbow should be slightly below the keyboard level. Sometimes the legs of a table need to be cut off to lower it. Or, again, a child may be raised sufficiently in his seat by using a cushion. But in all this, good standards of posture should be adhered to. Certain school furniture companies have worked out desks suitable for children which are adapted to the use of the typewriter. The typewriter stands on a lower shelf, and when the desk is closed the typewriter is inside the desk, under the lid. The top of the desk can then be lifted and the typewriter on the inside shelf will be on the proper level for the child's use. When other school activities, including handwriting, are engaged in, the lid is pulled back into place and is on a proper level for those activities.

The care of the machines by the children, in moving them about the room, in handling and in storing, is important. Arrangements for storage closets, built in or bought, easy of access for those using them, is another important administrative feature. The closets should be locked when not needed open. Also, it is important to consider care in the use of the machine, keeping it in good operating condition. The provisions for annual overhauling by local agents once a year, during vacation periods, will go a long way toward preserving the life of typewriters. Emergency repairs should not be frequent, if necessary at all.

Learning the correct use of the typewriter's parts and devices is necessary, and incidentally helps to keep the machine in good order. A number of good guide-books for all ages of children are beginning to appear on the market. The early attempts at writing on the typewriter should be informal, with a view to finding purposeful uses of the machine. The teacher will need such helps as wall charts and possibly individual charts to help children become familiar with the keyboard and the other parts of the machine. Some teachers have found it advisable to use half-sheets of paper when pupils begin to typewrite.

A typewriting lesson in the second grade at Horace Mann School

First-grade pupils at Horace Mann take typing seriously. (Associated Press Photo)

Teaching-Problems

The classroom teacher is of course concerned with the number of typewriters allowed for her room; where these can be placed and stored; the necessity for developing careful handling of the machines and showing children how to put on and take off covers, and how to lock and unlock the carriage. Primarily, however, she is concerned with the adjustment of classroom work which is required to use the machines effectively; with adapting the use of the machines to adequate learning-situations; and with arrangement of time schedule for use of the machines. Prior to these activities, the teacher needs to familiarize herself with the machine and its parts in order to demonstrate it and help the children to use it effectively. In some cases, a member of the stenographic staff of a school may be called on to advise the teacher and give preliminary information concerning the mechanical features of the typewriter. The operation of the typewriter is a simple process, however, and a few hours concentrated on trying out the various parts of the machine with a suitable guide-book is all that is required. Expert typing is attained after long practice, but expert ability is not necessary and perhaps not even desirable for the elementary school teacher.

The classroom teacher needs also to be on the alert to see that children, when using the typewriter, have good body posture, sit erect, at correct height, and have their feet flat on the floor; that there is no strain on eyes from poor or incorrect lighting or from small-size type. Also, there should be no nerve strain or tension when using the machine.

Children are keenly interested in using the machine for many kinds of activities, and the desire to operate the machine can easily be used to motivate the learning of its parts and their proper use. Children can obtain successful results quickly in anything which holds their interest and encourages them to go on. Good work habits are developed. Pupils enjoy using a machine and feel pride in their accomplishment. Almost at once they see possibilities for further writing-problems. The general morale is raised because clear and neat work is more easily attained. There is a better attitude toward work, more alertness and confidence in attacking problems, in developing ideas, and in participating in varied activities.

Substitution of Equipment

Naturally there will be some situations where the teacher is encouraged to use the typewriter in her classroom but where no special provision is made for supplying the equipment. In such cases she will need to be ingenious and think up various ways to adapt the facilities at hand to attain the desired ends.

She may find it advisable to borrow, from family, friends or other children, two or three typewriters and other equipment. A group of teachers may combine, each collecting two or three typewriters and exchanging them so that each room will have the use of the typewriters for a certain period of the day. Or the typewriters may be kept locked in a special place, with a regular, weekly, date pad, so that teachers can arrange ahead any dates on which the typewriters are to be reserved. This system can often be carried out through the cooperation of the school library, where children who need to use the typewriters can borrow one for a certain part of the day, just as they would draw out a library book.

Aims for the Future

The chief aims for the administrator and teacher in the use of the typewriter are to adapt it to the children's psychological and social needs. Experience and research have shown that the typewriter is one kind of equipment that can meet these needs effectively. Therefore, like other equipment valuable to both present and future living, it is used by the alert administrator and teacher to fulfill a vision of child learning in the light of child experience and child growth.

WORK ROOMS IN COLLEGE AND UNIVERSITY LIBRARIES

By EDNA R. HANLEY

Librarian, Agnes Scott College, Decatur, Ga.

THE primary function of a college library is to make available for students and for faculty books and materials supplementing the instructional program of the college. It is obvious that the physical plant can either contribute greatly toward the realization of this purpose, or be one of its greatest hindrances. The recognized necessities have always included sufficient space for the storage of the book collection, quarters for the administrative work of the library staff, and seating space for a calculated number of readers in an adequately administered building. The arrangement of these and of their supplementary factors depends on the ingenuity of the architect, the specific variations and adaptations for particular local requirements, and the amount of money at the disposal of the builder.

In making his initial calculations, the architect consults with the librarian to find the number of books in the present collection and to estimate the space which will be required at the end of, say, fifty years. He consults with the college officials to find the number of persons who will be using the building, and to estimate the growth which may be expected. He follows this by a general discussion of the planning and locating of various features of the building. However, even with all the discussion, one finds on studying college library building plans that there has seemingly been no concentration on providing ample and convenient space for the efficient operation of the library staff.

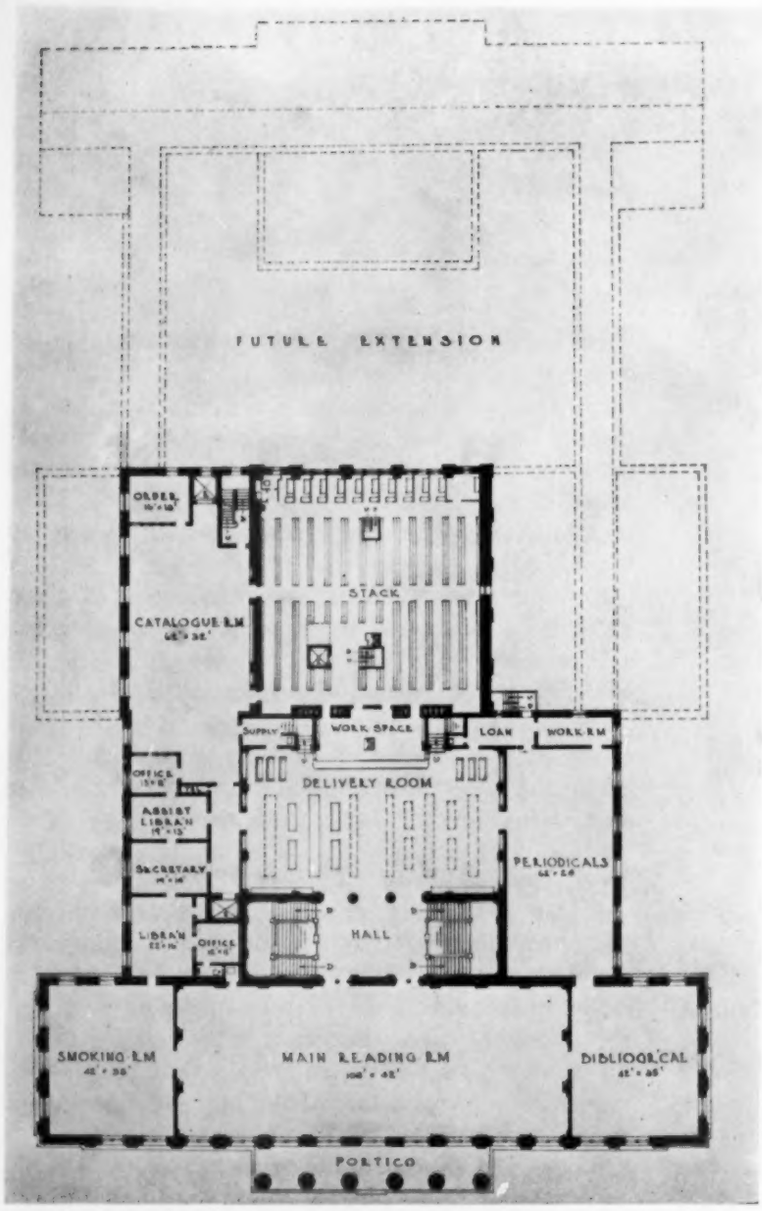
It is needless to point out to one familiar with libraries that the successful operation of the entire building and the ultimate service rendered to those using it are dependent on the proper functioning of the staff in charge. Their work cannot be done in the most capable manner unless care and thought for their convenience and comfort are taken in preparing the original plans. Theirs is a highly complex task, the full intricacies of which can be realized only by one who has dealt with it. To those using the library, the staff is there merely for the purpose of serving them in any capacity they may see fit to require, from giving information about the library itself, to obtaining some first edition or the latest novel. But back of this is the actual administrative work—the ordering of books, the receiving and checking of orders, cataloging and classifying, and, finally, the actual preparation of the books for the shelves. Besides books, there is the separate field of periodicals, which must be checked and at regular intervals prepared for binding. Whether the library is large or small, the technical processes remain the same, varying only in degree.

For the most effective accomplishment of these tasks, the fundamental requirements are the same for a large building as for a small one—sufficiency of space, and convenience of arrangement. It is imperative that both these factors be given the most attentive consideration at the time of construction to insure the library's successful operation and its later expansion to meet demands made upon it.

Sufficient Working Space

A lack of working space with the attendant hampering of administrative activities in the libraries of some of our large university centers has made it increasingly evident that careful planning is necessary, and has given librarians a new conception of the value of such space. An architect's blueprint may take adequate cognizance of the needs of the staff at the time of building, and provide for them then, as if disposed of forever. The problem is not so simple as this, however, as some of the larger libraries have found and are continuing to find, when they are forced to enlarge their quarters and to extend their scale of operations. In the earlier days of library building the designers seemed to overlook the fact that a new and improved building with greater facilities for service will inevitably mean, in addition to an increased use of the library in all its branches and an increase in resources, likewise an additional number of people to care for it. Because of a lack of sufficient provision for such expansion, a librarian may be hampered by crowded work rooms, although his building is practically new.

Recognition must be taken of the merely physical features which the work rooms of necessity include. In addition to the built-in features that can and should be provided (lavatories, toilets, and adequate closet space for storing supplies), there must be room



Second floor plan, University of Rochester Library

for the desks and chairs of regular office equipment, and the furniture peculiar to library offices. This includes space for booktrucks, bookcases, ample aisle space for movement of persons and trucks, space for card catalogs, typewriter stands, shelving for reference books. The work carried on here must proceed in an efficient and orderly fashion, and a generous amount of floor space is necessary to insure that it does so. Not less than 100 square feet should be allotted for each staff member, both present members and potential future members.

While it is not possible to forecast exactly the growth of a library or of its staff, it seems wiser to provide too much than too little area. The building having been erected, it is usually impossible to provide for additional adjacent working space. It may be that rooms in another portion of the building can be utilized. However, the various processes of preparing books for circulation are so interrelated that there would be a considerable loss of time if they were scattered, and administrative costs would thereby be increased.

Convenience of Arrangement

This presents the second problem—that of arrangement. An arrangement which makes for the greatest possible conservation of effort through location convenient to all branches of the work will result not only in lower cost of operation through time saved, but also in greater general efficiency throughout. When planning the location of administrative offices and work rooms, it is highly desirable that they be near the public catalog, and with direct entrance into the bookstacks. If possible, the staff quarters should be en suite and in close juxtaposition to one another.

AT THE UNIVERSITY OF ROCHESTER

This is the arrangement at the University of Rochester library, where offices and work rooms are on the second floor, contiguous to the delivery room. There are two entrances from the catalog room into the stacks, and one into the delivery room, where the card catalog is located. The catalog room, with an area of about 2,000 square feet (32 x 62), has an office at one end for the order librarian, and one at the opposite end for the head cataloger. This adjoins the office of the assistant librarian, while the secretary's office is between that of the librarian and the assistant librarian. This arrangement places the greater part of the staff together on the same floor in proximity to the main reading room as well as to the delivery room and the bookstacks.

The receiving room is in the basement beneath the order librarian's office. Books are unpacked there and placed on a book truck to be taken by elevator to the order department office for checking with the invoice and order cards. After being collated, they pass through the cataloging and classification departments and finally are prepared for the shelves. This arrangement, planned around these several processes, permits efficient and orderly handling.

AT ATLANTA UNIVERSITY

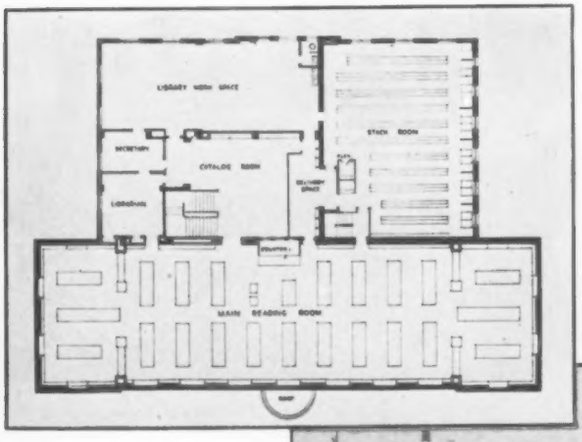
The Atlanta University library, designed by James Gamble Rogers, combines excellent arrangement with thought and care for general pleasant surroundings for the benefit of the staff. The offices and working space are in the shape of an ell surrounding the circulation lobby, where the card catalog and delivery desk are located. The cataloging and classification office at Atlanta is in one large room on the second floor and has a southern exposure.

AT THE UNIVERSITY OF MICHIGAN

In the University of Michigan library the technical processes are grouped in one large room on the entrance floor, while the librarian, associate librarian, and stenographers have offices on the second floor directly above the work room. There is, however, a stairway (numbered 2 in the diagram) leading from the office of the librarian directly into the work room below, and giving him perfect freedom of entry and communication at all times. The public card catalog is located on the second floor and is connected by a stairway (No. 1) to the work room. Because of the separation of the card catalog from the cataloging and classification departments, however, it is necessary to maintain an official catalog on the first floor for the use of the staff.

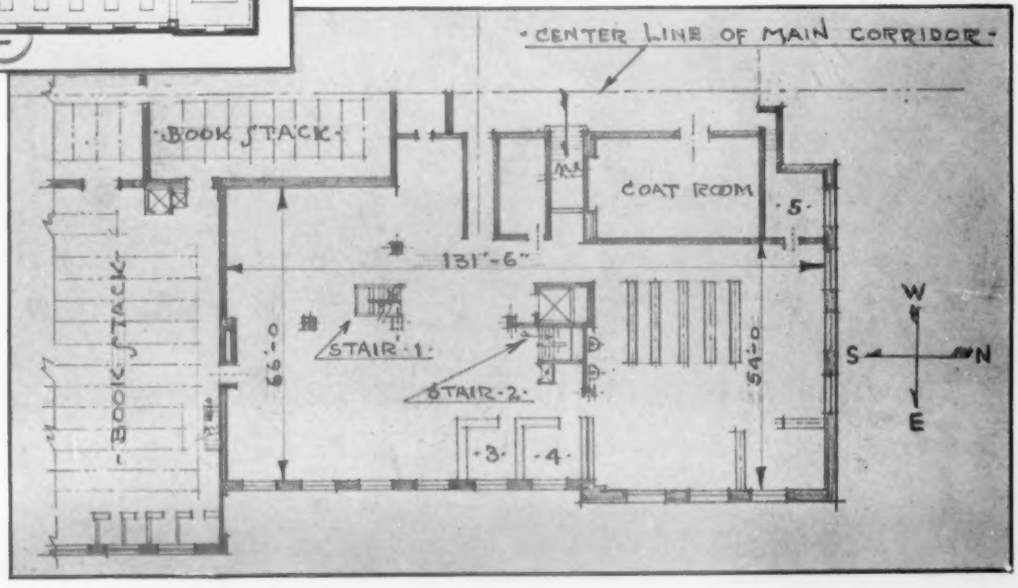
At Michigan it is interesting to note the logical arrangement and relationship of the different departments to each other and to the stacks. Incoming books are received in the work rooms first in the office of the order librarian (No. 5) for the regular rechecking process. They then proceed straight across the work room to the classification (No. 4) and cataloging (No. 3) offices, then to the outer large work space to be prepared actually for the shelves, then to the stacks directly.

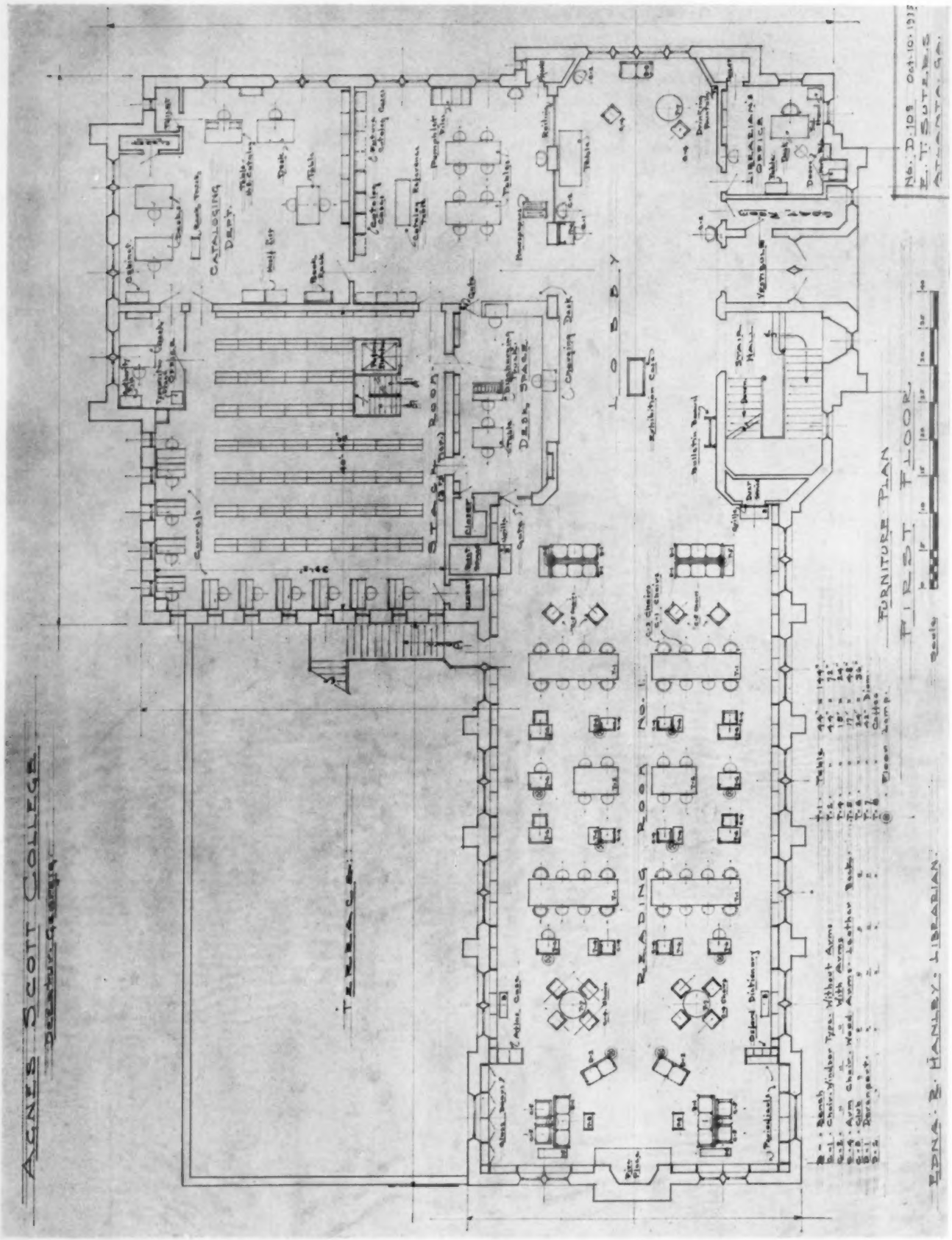
The work room here likewise illustrates the finest possible provision for growth and rearrangement, since it is entirely free from partitions. Offices for heads of the cataloging and classification departments are formed by enclosing and easily transferable floor bookcases. Thus the entire room is flexible and can be changed as circumstances may demand.



Left—Plan of the second floor of the library building, Atlanta University

Below—The staff work room on the first floor of the library at the University of Michigan




AGNES SCOTT COLLEGE
DECATUR, GEORGIA
FURNITURE PLAN
FIRST FLOOR
LOBBY
READING ROOM
CATALOGING DEPT.
LIBRARIAN'S OFFICE
STACK ROOM
DESK SPACE
TERRACE
EDNA B. HANLEY, LIBRARIAN.

Two desks and a filing case for the shelf list are not shown in this photograph of the cataloging room

AT AGNES SCOTT COLLEGE

In the design of the new library at Agnes Scott College the comfort and convenience of the staff were given as great value as any other single feature, and it truly embodies all possible elements which could contribute to the achievement of this end. The building is L-shaped. One wing, two stories in height, consists of a large reading room on each floor. The other wing is four stories, and contains storage and unassigned space on the ground floor, lobby and administrative quarters on the first floor, seminars, staff lounge, and projection and typing rooms on the second, with a museum on the top floor. The six decks of the bookstacks are located in the internal angle of the building, with the work room on the first floor opening from them. The card catalog is just outside the work room and near the delivery desk. Adjacent to the work room and opening into the stacks is an office of about 120 square feet for the head cataloger. It was architecturally impossible to have the librarian's office adjoin the cataloging room, although it is on the same floor and within a short distance from it. However, there is a local telephone connecting the office of the librarian with the cataloging room, which aids in eliminating many steps.

An attractive staff lounge for rest and recreational purposes was included in the plans for the new library at Agnes Scott College

Other Essential Rooms

In some of the larger libraries a bindery is considered a necessary part of the equipment. Where this is so, it need not be in the same part of the building as the main work room, but should be located with convenient access to the stacks. In a smaller library, it is cheaper to send books and periodicals out for binding. It is desirable, though, to set aside some space where small repair work can be done.

In any library a receiving room is practically indispensable. Particularly is this true where large shipments of books are received daily. The University of Rochester is adequately equipped in this particular detail, with a receiving room in the basement. It is directly beneath the office of the order librarian and is connected to the work rooms on the second floor by an elevator. This handles the actual receiving of heavy shipments on the lowest possible level, while at the same time making it convenient to send them through the various processes required later.

Not only should the staff be equipped to carry out the actual work as conveniently and as comfortably as possible, but they should have pleasant lounges for rest and recreational periods. These need no longer contain merely bare essentials, but may be made as attractive as the budget permits. There should be rest rooms, locker room, lavatories, and kitchenette. Tea served in the afternoon gives the members of the staff an enjoyable few moments of respite from the busy work and students, and provides relaxation for those sitting at desks and typewriters. Pleasant surroundings and consideration for a staff tend to create and to maintain an atmosphere of harmony and esprit de corps which is desirable in every library group.

Lighting—Ventilating—Heating

Although the problems of lighting, ventilating, and heating the work rooms, offices, and all rooms to be occupied by the staff are common to the remainder of the building and undoubtedly dependent on the entire system, it is well to bear in mind the fact that special attention should be paid to these essentials. After all, the staff spends some seven or eight hours daily in the same quarters, for the most part, and any uncomfortable feature can easily become greatly magnified by constant association. The work is of such nature that, for best results, good light, fresh air, and comfortable desks and chairs are a necessity.

Of illumination, it is necessary to say only that, while sunlight is obviously to be preferred, there is still precaution to be taken even when conditions are most favorable for having a full day of sunlight. An accepted standard is that window area should equal 25 per cent of the floor area. This will vary in different sections of the country. In some places the air is clear and strong light prevails. This is the case near Atlanta, and both Atlanta University and Agnes Scott College were forced to take special measures to prevent glare. The work rooms in both these libraries have a southern exposure to obtain all the breeze possible. Venetian blinds have been utilized effectively for a maximum of light without causing undue strain. Naturally, the architect in any case will take the local conditions into consideration in his plans.

Artificial illumination presents an engineering problem complete in itself. Enormous improvements are continually being made in this science, but it need not be discussed here except to point out that some eyes require much less light than others. Serious thought should be given, therefore, in work rooms as well as in the entire library building, to providing different quantities of light to take care of these individual differences.

Equally important with the lighting system is the ventilation, which is really a physiological problem. Good ventilation means maintaining a supply of fresh air heated to a comfortable temperature of 70 degrees, with a relative humidity during the winter months of about 50 per cent. There should be a slow movement of the air (without causing drafts), and preferably in a vertical line.

Considering, then, all the factors involved, and studying present college and university library building plans, their good points and their deficiencies, one should be able to determine what is adequate provision for the library staff. From librarians laboring at a disadvantage because of insufficient working space, one may learn caution in planning. From those who have been successful in meeting the problem, a college or university planning to erect a library building may well take advice in dealing with the local situation.

Bishop, W. W.: "Rooms and Equipment." (In his "Practical Handbook of Modern Library Cataloging." 2d ed. Williams and Wilkins Co., Baltimore. 1927. pp. 20-36.)
Gerould, J. T.: "The Administrative Offices, Order and Cataloguing Rooms." (In his "The College Library Building." Scribner's, New York. 1932. pp. 81-88.)
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THE SHOREWOOD HIGH-SCHOOL AUDITORIUM

An Application of Modern Concepts and Practices in Auditorium Design

THE latest ideas and most advanced practice in school auditorium design were presented in an article on "Equipment for School Dramatics," prepared for the 1936 edition of THE AMERICAN SCHOOL AND UNIVERSITY by Theodore Fuchs of the Northwestern University Department of Dramatic Production, a theater and lighting consultant. In view of the type of auditorium usually provided for secondary schools of average size, Mr. Fuchs felt that some of his recommendations might be considered too elaborate or somewhat superfluous and impractical. So, as an example of the concrete application of his recommendations to a specific school-building project, he cited the case of the Shorewood High-School Auditorium, of Shorewood, Wis., then under construction, for which he served as consultant.

At the present time the Shorewood auditorium has been in operation for over a year. During this period it has proved itself eminently satisfactory for the purposes for which it was designed, and has more than justified itself as an educational and community investment. But more than this, it has attracted the country-wide attention of educators, architects, and experts in school planning, and is serving as a model for other auditoriums now being designed. When Lee Simonson, the internationally known stage designer and co-founder of the Theatre Guild in New York, inspected the auditorium, he expressed amazement at the scope and the completeness of its facilities. He said that, except for perhaps three or four of the highly specialized elaborate professional playhouses in New York, there was no theater in the country in which he would rather produce a play. Yet the building was designed primarily as a high-school auditorium, not as a theater.

In view of the unusual interest created by the Shorewood auditorium, the editors of THE AMERICAN SCHOOL AND UNIVERSITY, in the belief that their readers would share this interest, decided to follow up the original brief description of the project with a discussion of the completed, fully-functioning building and the uses to which it is being put. Accordingly, the six persons most intimately associated with the planning, the execution, and the use of the auditorium were asked to discuss its various aspects, each from his own particular interest and point of view.

The Superintendent of Schools,

H. S. HEMENWAY,

discusses the general features of auditorium planning for the community school

IN PLANNING the school auditorium, a strict definition of the functions to be served is essential if clear thinking is to result. Several types of auditoriums are in use. Which one fits the purposes of your school? Why?

Dual Purpose Planning Rarely Advisable

Many communities have made the mistake of trying to combine gymnasiums with auditoriums. Such procedures seldom work out satisfactorily, for, in programing the high-school set-up, it is usually found that either the physical education or the music-speech departments of a school could use an auditorium full time; consequently, neither program receives adequate consideration. Athletic contests held on the stage simply mean that proper stage equipment on which good dramatic work depends is out.

Sometimes misguided individuals want to make of the building an exhibition hall for the business shows of that section of the state. Although ready to admit that the room will be used only a few days per year for such a purpose, they believe such functions should be given consideration. If the superintendent ever yields to such suggestions, he may as well cancel any build-up he has had in mind for outstanding assemblies, or fine arts productions, since the movable seats, necessitated under this program, will eventually squeak; and the flat floor, also a requirement, will not provide the correct angles of sight which make seeing or hearing in a well-planned theater a joy. A dance floor combined with an assembly room is equally poor. That superintendent is wise who desires an auditorium which is planned for fine arts programs alone but which, nevertheless, has elements of flexibility built into it which make it suitable for many different types of activities.

Auditoriums Can Be Too Large

Many high school assembly halls are far too large. Intimacy with the stage is lost in barns which seat 2,500 or more. Of course, there are certain times of the year, like commencement, when seating capacity is at a premium. However, the superintendent planning an auditorium should consider the advantages of a well-equipped hall seating 500 to 1,000, and carefully weigh the cost of the relatively few events served when seating capacity is planned much in excess of 1,500, unless many galleries are used and thus the stage-spectator distance kept within bounds. Generally, a smaller auditorium fills a greater need in a community, the expense of operation and upkeep is reduced, and several smaller performances rather than one huge spectacle keep the house in use. Different casts may be used under this plan with the same play, and enrolment of a large high school divided for assemblies into different smaller groups where the "age appeal" is nearly constant. With Yale and Iowa University theaters approaching more nearly 500 seating capacity than 1,000, the person responsible for planning the high-school auditorium may well save costs by surveying all possible uses for the building, and planning for minimum seating capacity with maximum community values.

The Stage Should Be Large

The stage itself, however, should be large enough to provide ample room for all the numerous activities of a modern school. For example, the school with a band, an orchestra and an a cappella choir needs stage room at least 30 by 60 feet, with additional off-stage space, if these three organizations are to appear simultaneously in any pageant or music festival. Generally, auditoriums are built too large and stages too small. In fact, a stage built with additional room tends to make the entire plant more usable, for often demands which could not otherwise be met are practical in the extra space provided.

Door to Street Advisable on Stage

A wide door direct to the street is advisable for stages. This enables scenery and equipment to be delivered with a minimum of trouble. If planned correctly, large animals and even automobiles may be driven on the stage. This is a feature which costs little but adds materially to usability.

Adequate "Fly" Space Essential

The person responsible for the educational planning of a stage should ascertain that ample space is reserved above the stage for "flying" of standard scenes, lights, movie screens and special scenes. The angle of sight should be plotted from representative seats in the house both horizontally and vertically, so that it is clearly evident that every seat is a good one. Architects sometimes argue against the high fly loft, owing to expense, but their arguments more often conceal the fact that a huge vertical room presents problems of layout difficult to solve. If the theater is to function effectively, such space is essential.

Storage Space

No stage ever has too much storage or off-stage room. Generally, at least an area equal to the main stage should be given this function, and as much more as is possible. Corridors running near a stage may sometimes be so designed as to help eliminate traffic on the stage.

Auxiliary Rooms and Auxiliary Theater

The lack of provision for auxiliary rooms for the stage is a noticeable failing in most schools. If the desire of the high-school program is to provide lifelike situations, provision must be made for a costume design room and a stage flat and scene shop, preferably more than one story high. This, together with two make-up rooms capable of seating twelve to fifteen students in each, is the minimum number of auxiliary rooms which should be provided.

If the proposed schedule for the main stage is at all complex, at least one smaller "Little Theater" for rehearsal and class work is desirable. If it can be equipped with portable light board, foots and dimmers, much time can be saved in the use of the main stage.

Minor Items Which Should Receive Consideration

a. *Natural Lighting.*—Unless the school auditorium is to serve some dual purpose, it is well to consider the elimination of all natural lighting. Generally, windows are installed, and expensive darkening equipment purchased, which, once pulled shut, is seldom opened. Artificial lighting for auditoriums can be controlled; natural daylight differs with the weather. Today most schools eliminate skylights and windows from auditoriums having theater functions.

b. *Stage Apron.*—The stage apron is definitely on its way out. Formerly it served very inadequately as a place "before the main curtain" for announcements. Now a deeper set curtain takes its place. The stage apron had the disadvantage of being in front of the stage lighting equipment, and consequently was often poorly lighted. The space formerly taken by it has been added, in modern schools, to the orchestra pit. A large school orchestra needs space.

c. *Acoustical Treatment and Sound Deadening.*—The separate functions of acoustical treatment and sound deadening are often confused in the lay mind. With the knowledge of acoustical treatment now available, no auditorium ought to have poor hearing conditions. Sound deadening should be used to insulate completely the stage and main hall from all noises—pianos playing, hammering of the scene shop, or noise from a corridor.

d. *Seating.*—As has been suggested elsewhere, in planning an auditorium the use of a fixed upholstered seat is far preferable to that of any movable so far developed.

e. *Flexibility in Stage Lighting the Big Consideration.*—In stage lighting, flexibility is the big consideration, for most stages today have adequate illumination so far as volume is concerned. Flexibility will be served through the provision for numerous stage pockets where spots may be attached, and for the reservation in the stage board of a majority of "free" dimmers to which lights may be plugged.

f. *Plaster Cyclorama Has Uses.*—If possible, the rear wall of the stage may be roughly plastered to be used as a curtain for lights for outdoor scenes. Equipped thus, it is a very useful and relatively inexpensive stage adjunct.

g. *Indirect Footlights.*—Some of the newest installations of stage footlights are below the stage floor and are reflected from a curved metal shield, thus fusing and blending their lights before reaching the stage scene. This arrangement also does away with much of the old-time obstruction of view of activities where observation of the feet of the performers was essential.

Large Floodlights in Auditorium Focused on Stage

Even with the elimination of the stage apron, there is a need for general illumination coming from a point remote from the stage. To secure such effects, several high-power lights are usually mounted in front of one of the main beams of the ceiling of the auditorium in such a manner that they may be operated from the stage light board. "Catwalks" above the ceiling provide for adjusting and servicing such lights.

Location of Music and Speech Rooms

In planning the complete auditorium set-up, if the rooms housing speech, dramatics, and music can be located near the main auditorium, rehearsal time will be saved and a better program can be developed.

Making Use of the Auditorium

Many building utilization surveys show that high-school auditoriums, unless used for study halls, are occupied but a small percentage of the time. In many schools the rigidity of the program works against such use. Dramatics, speech, music and the fine arts program in general are developed only as extra-curricular activities. Such a school in reality does not need a well-planned auditorium, since values are emphasized elsewhere in the curriculum. Educators, however, who have caught the vision as to what a fine arts program may mean in the lives of school children and the adult members of the community, who know how to plan programs so as to utilize possibilities given them—these individuals do need auditoriums, planned as suggested; for time in such schools is utilized in developing appreciative personalities possessing fine sensitivity, and, for such, an auditorium program embracing the fine arts in every form is a method of living if not a life itself.

The Director of the Board of Education,

ADOLF HAFNER,

discusses the Shorewood Auditorium from the standpoint of the community and the taxpayer

IN SOME respects the Shorewood community auditorium was planned long before the actual building was erected. Years ago it was suggested that park areas be combined with school grounds so that an ideal site of nineteen acres could be secured. Someone else said, "It will be a long time before we'll have the money to erect a complete high-school building. We must build in units." And another citizen added, "Since we must build in units, why not house our individual departments in complete buildings? A manual arts building would banish from the rest of the school the noise of saws; a physical education building would have wonderful light and air; an auditorium could have dramatic arts and music grouped around it."

And so it was that the school built its manual arts unit, its gymnasium, its administration building, its arts and science unit—all this time waiting for the day that an auditorium could be constructed. Meanwhile the departments of music and speech were conferring with school executives on the form which the final building was to take.

Today, the building is complete and serves a community in a way few buildings can. More adults than children attend school in Shorewood, and the auditorium is the meeting place not only for classes in all forms of dramatics, arts and music, but also for clubs, community social gatherings, and a lecture course with an average attendance of over 1,000 individuals. Our auditorium is a factor in our lives. Like the cathedrals of old, it was built by the community not to remain idle the majority of the time, but to be used. Five thousand events are scheduled a year in advance, and embrace everything from a committee meeting of the American Legion to the production of light opera!

Board Policies Contributing to Success of Auditorium

No doubt the policy followed by the Board concerning the use of school buildings is a factor in the development of this school-centered community program. Someone has referred to certain suburban high schools as "community clubs." And why not? Buildings are far too expensive to construct to allow them to be vacant Saturdays, Sundays, evenings and vacations. After all, the additional cost for night use of buildings is the cost of supervision, janitor work, heat and light. The Shorewood educational budget totals about $500,000; $30,000 of this is used by the adults of the community in providing school and recreational facilities, year round, for approximately 5,000 active participants. A community possessing fine school buildings which does not use them for evening adult activities because of the cost is like the family possessing a fine car and refusing to use it nights because of the cost of gasoline. Both are short-sighted policies.

Another policy of the Board which influences the use of the building is that concerned with the providing of equipment. Many boards earnestly believe that they save the taxpayer substantial sums through skimping on the furnishings of a new project. If board members knew what the assessment of the average home in their district was, if they knew just how much money needs to be saved on equipment to save 10 cents on the tax rate, there would be more listening on the part of a board when teachers request equipment, and less vetoing of their judgments. The Shorewood community auditorium has been fully equipped. No requests for additional amounts have been received since its completion. Consequently, both day and night schools can work effectively without loss of time. There is a joy in doing a task well. The board which provides excellent equipment, well selected by experts in the field, makes a decided contribution to the completion of a good performance.

COST OF SHOREWOOD HIGH SCHOOL AUDITORIUM

Planning, supervision, incidental expense	
Architect, engineers, consultants, supervisors, etc.	$ 17,200
Bond issue cost, legal expense, insurance, etc.	2,000
Construction	
General construction	203,700
Plumbing and heating	32,200
Electrical work (including stage switchboard and permanent stage lighting equipment)	27,100
Gas, electric, and telephone connections	1,400
Equipment	
Auditorium seating and carpeting	11,200
Stage rigging	5,300
Portable stage lighting equipment	1,200
Cafeteria equipment	2,600
Furniture and miscellaneous equipment	7,600
Total	$311,500

The Architect,

WILLIAM G. HERBST,*

discusses the planning of the Shorewood Auditorium and some of its principal features

IN THE spring of 1933 the Board of Education of the village of Shorewood was confronted with the necessity of providing an auditorium building for the completion of its school program. At our first conference with the school authorities, the functions and requirements of this auditorium were somewhat vague and experimental. After several preliminary layouts were submitted, the plan soon developed into concrete form, and the necessary requirements were met. Having had the benefit of being called into conference with the Board of Education from the very inception of the auditorium idea, we were able to conceive and carry into form the functions for which the building was to be used.

Functional Planning a Slow Process

It developed that the auditorium should house the instrumental, vocal, and dramatic arts and serve both school purposes and the adult community. It was not to be just another barn-like auditorium of huge dimensions to house the whole community, but a practical building, the physical facilities of which were to be a veritable laboratory for the teaching and practical application of the various arts housed therein. This involved careful research and study of the requirements and functions of the present-day theater, together with conferences of the heads of the various departments, so that a unified, workable plan could be developed. The Board of Education used wisdom and good judgment in giving ample time for this development, and the results of this cautious procedure have proved it justifiable.

The entire group of buildings comprising the Shorewood High School is built on the campus plan. This called for an isolated auditorium building, the construction of which should be fireproof and of materials minimizing maintenance and upkeep. The largest single unit in the building is the auditorium, and since the relatively high capacity of 1,300 seats was demanded for community use, the room had to be made wide and cone-shaped in order to bring the audience within intimate relation to the stage, and have every seat within vision of the entire proscenium opening.

Adequate stage facilities were provided having an area 72 feet wide and 32 feet deep, with a 36-foot proscenium opening. Adjacent to the stage is a scene shop 26 feet high, where the students are instructed in the building of scenery and stage properties. The back wall of the stage was designed for a permanent cyclorama. The height of the rigging loft was so designed that the occupant of the first row of seats has a clear vision of the cyclorama 30 feet above the stage level. The floor of the stage is 2¼ inches thick, laid in mastic to avoid any hollow sounds or vibrations. The entire center section is made removable. To the right on the stage floor level is located the scene rigging, making it possible and convenient to instruct the student body in the handling and use of this equipment. To give more workable space on the stage, the switchboard was elevated just enough to give the operator a clear view of the stage. Within easy access of the main stage is the Little Theatre classroom, having a capacity of about 150 students. A small rehearsal stage is located at one end, equipped with a complete portable switch and dimmer board. Adequate facilities were provided for the making of costumes and a place for their storage, make-up rooms, wash-rooms, and showers, all within easy reach of the stage proper.

The classroom wing of the building is divided into two large-size band rooms, and storage room for instruments and music, two a cappella choir rooms, three private music rooms, one speech-recording room, instructors' offices and two classrooms. At the front of the auditorium a spacious foyer has been provided, adjacent to which are located wardrobe facilities, women's and men's lounges, box office and public telephone booths.

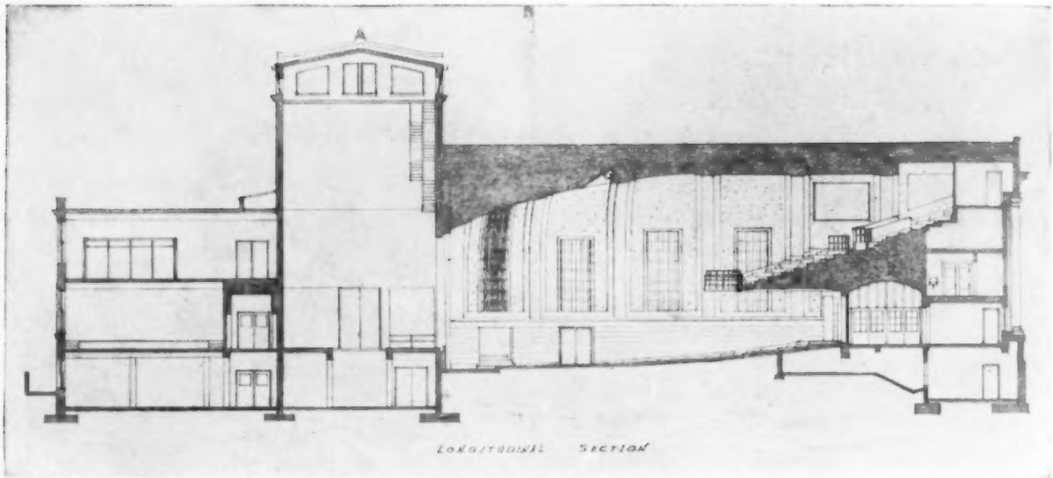
In the basement of the classroom wing are a spacious cafeteria, a kitchen and a faculty dining room.

In order to minimize the noise during class changes, all corridor floors are built up of a resilient floor covering. All band, a cappella and music rooms as well as the auditorium proper are acoustically treated.

There are no exterior windows in the auditorium; filtered and humidified air is delivered into the auditorium by mechanical means and exhausted in the same manner.

* Of Herbst and Kuenzli, Architects, Milwaukee, Wis.

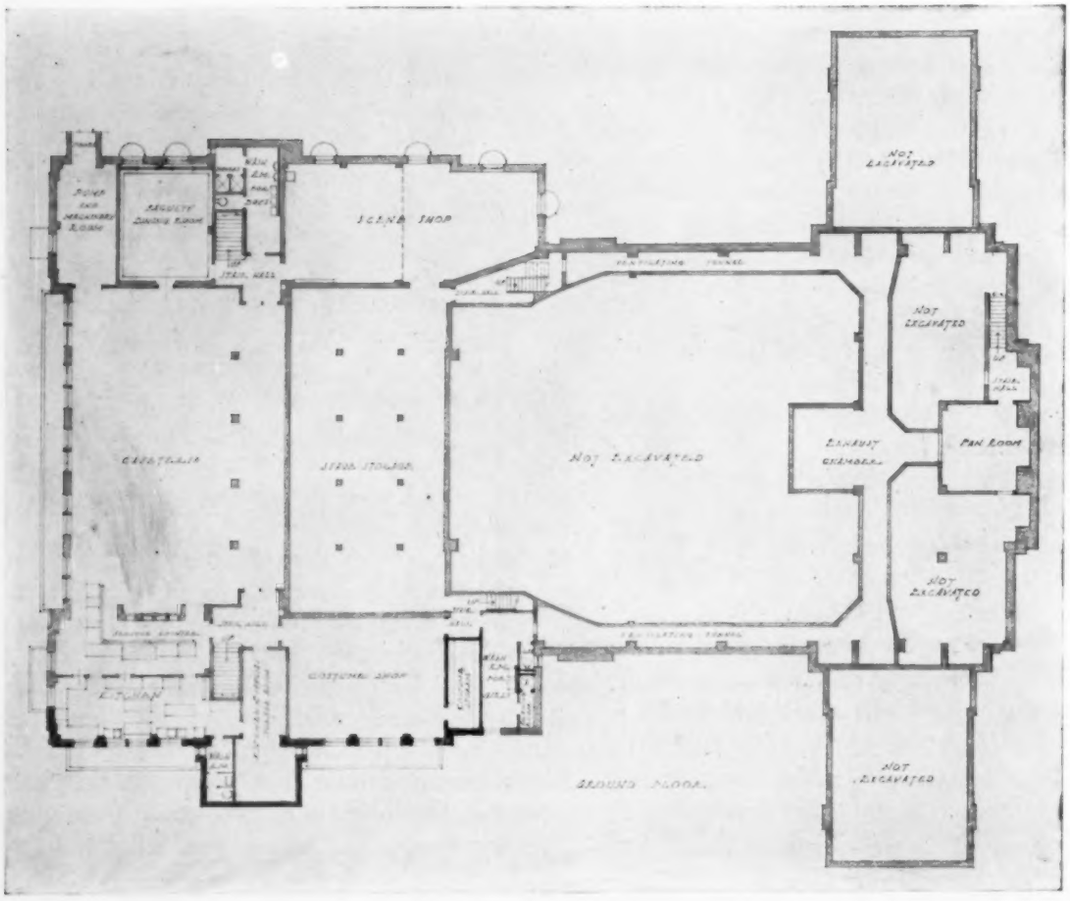
Longitudinal section



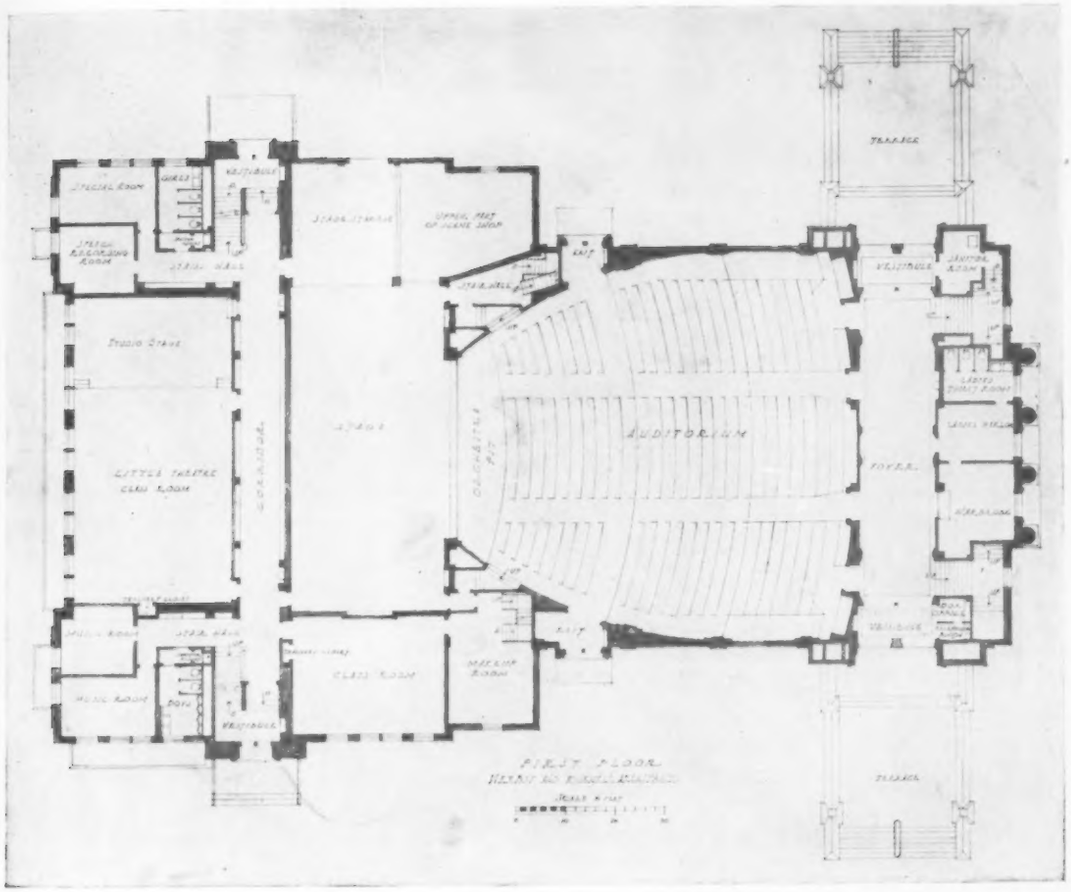
Herbst & Kuenzli, Architects; Theodore Fuchs, Theater and Lighting Consultant

The Shorewood High School is built on the campus plan, the various departments and activities housed in separate buildings. The auditorium building, plans of which are shown on these pages, houses the Dramatic Department and the Music Department, and is a good example of the practical application of the principles outlined in the accompanying articles. Because the auditorium was planned to house also occasional community activities, its seating capacity is relatively high, being approximately 1,300

The stage is adequate in size and completely equipped, both as to the mechanical equipment and as to the lighting and control equipment, with special attention given to the requirements and conditions of school dramatics. Adequate workshops and storage space are provided in close proximity to the stage. The necessary ports for the auditorium beam spotlights are provided at the proper points in the auditorium ceiling, as shown in the above view. The auditorium is without windows or skylights; the panels in the above longitudinal section, which are seemingly windows, are actually indications of the decorative and acoustic treatment of the walls

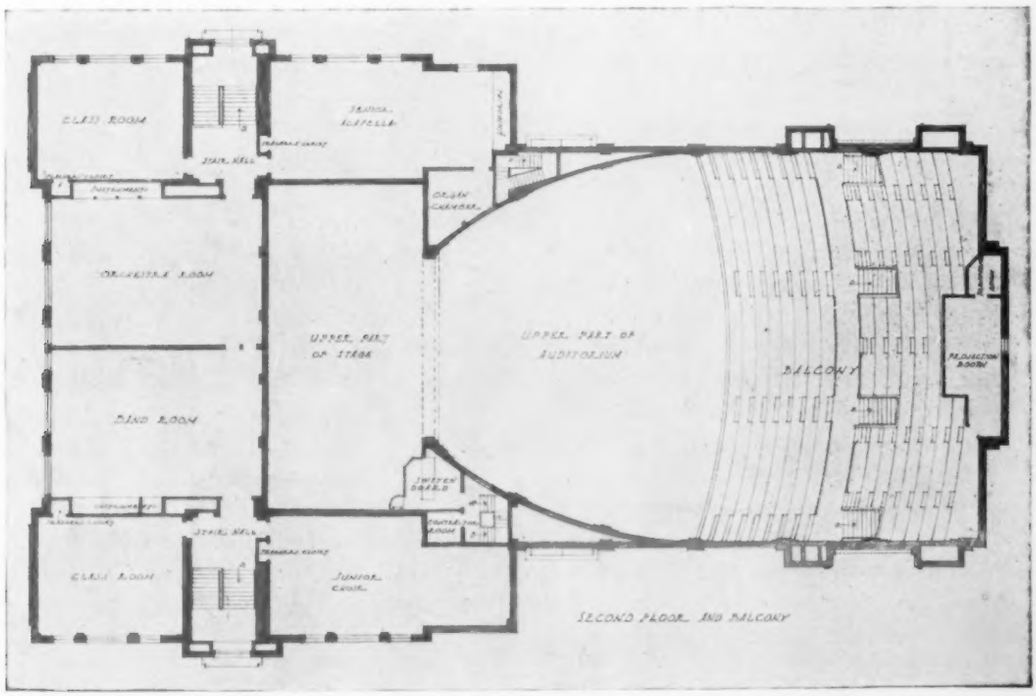


Ground floor plan



Main floor plan

The center of the stage is trapped, and the space beneath the stage is used for scene storage. Half of the scene shop is 26 feet high, to accommodate the building and the painting of tall pieces. A well-equipped studio theater is used for classroom work and presentations, and for minor rehearsals. The basement of the building contains also a small cafeteria for the students. Special acoustically-treated band, orchestra, and choir rehearsal rooms and music classrooms are provided on the second floor



Second floor and balcony plan

The Head of the Speech Department,

LENA FOLEY,

discusses the use of the Shorewood Auditorium as a laboratory for her work in dramatics

THE philosophy underlying our speech work at Shorewood High School denies that speech training is for the gifted few, and assumes that every student of a public school should be encouraged in such speech activities as will foster his particular interests and insure his maximum development. For example, contrary to the all too frequent practice of having tryouts for a dramatic club and taking only those already proficient in acting, we would rather offer so varied a program that both the talented actors and the crew members may progress, that the needy may be helped, and that all members may achieve what is undoubtedly one of the greatest contributions of high school dramatics—a realization of the significance of each individual's contribution to a cooperative enterprise.

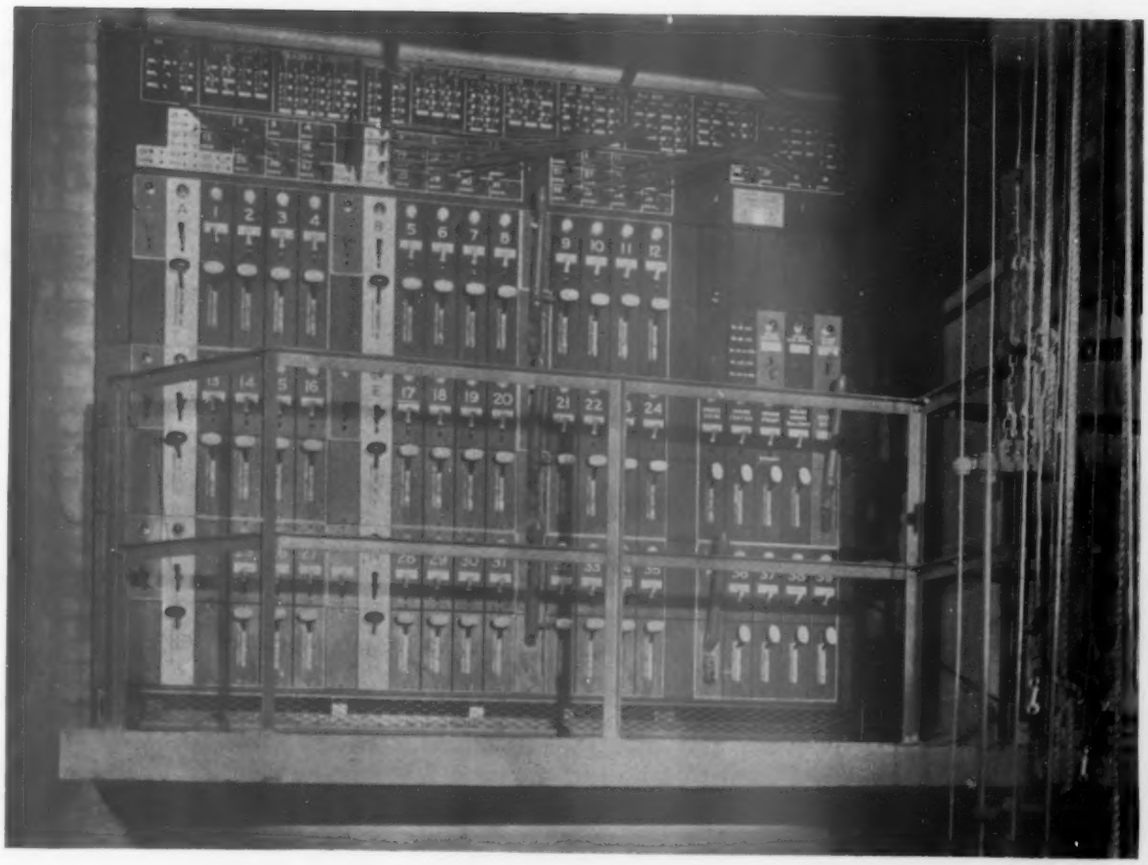
Pursuance of this philosophy has developed a system in our high school where almost one-fourth of the entire student body voluntarily participate in the various phases of dramatic activity, where every ninth-grade student is required to take regular class work in speech, and half of the upper classmen elect to take advanced work in the field. Our new high-school auditorium building was planned to house this extensive and varied program. Renting of costumes, buying of commercial sets, hiring professional make-up artists—all of which may make a production effective, but which lessen tremendously the educational value of a presentation—need never be resorted to in our present building.

Last March, our Senior Dramatic Club presented a suggestive realistic production of "Romeo and Juliet" in seventeen scenes. Three months before the production, a group of some twenty students could be seen in the costume design room, looking up the architecture and costumes of the period. This study led to the design of the seven different sets used for the production and the sixty costume plates of the costumes later executed in this same room by the same group. The designs for the sets were taken to the workshop, where thirty other members built these ideas into actual scenery. By means of wagon platforms, also constructed by members of the dramatic club group, these seven sets became the seventeen scenes required for the production. Whenever necessary, additional backgrounds were dropped in from the loft. Quick changes were facilitated by the excellent counterweight system. A group interested in make-up studied the hairdresses, beards, etc., of the period, sat in on rehearsals and came to understand the various characters. They practiced on one another and succeeded in doing an almost professional piece of make-up. The actors had to become familiar with the manners and customs of the period before they could enact their roles. The business committee carried on a four-weeks campaign of excellent publicity and succeeded in almost completely selling out the house of 1,300 seats for two nights. The property committee were busy in the recording room, making the sound effects for the production. This room is used during regular class hours for recording and analyzing student voices for the study of radio drama.

The facilities of the auditorium are such that all these groups were able to pursue their particular activities during the same extra-curricular hour without the work of one interfering with that of another. Thus, instead of a cast of 55 profiting by this production, approximately 175 students made a very vital contribution to its successes and thereby enjoyed an experience rich in educational value to each of them. During the same extra-curricular period two other large groups of less experienced actors were working on one-act plays which they presented in the Little Theatre for the students who had produced "Romeo and Juliet." The portable lighting equipment and simple screen scenery of the Little Theatre enable students in production classes to assume the entire responsibility for staging these plays.

This is a sketch of only one of the four major periods of activity connected with our public productions presented during the past school year. Every one of the two hundred members of the Senior Dramatic Club has participated in at least one play, and approximately three-fourths of the group have worked on at least two phases of the technical side of the productions. We seldom use the same person in the lead roles; at least fifty students have operated the switchboard during the season; at least a hundred students have actually made-up people for a real performance.

Notable features of the stage are its adequate size, useful proportions of off-stage space, and the completeness of its equipment. The high gridiron and the counterweight rigging system help keep the stage unusually clear and open. The switchboard (center of picture) is mounted on a balcony at stage right. The teaser and tormentor lights, the movable light towers, and the glareless indirect footlights, represent the best modern methods in stage-lighting practice—methods which are ideally adapted to educational use on a school theater stage. The main black cyclorama drapes, which are 30 feet high, provide a gage for judging vertical distance



From this point all the stage lights and auditorium lights are controlled. The switchboard is of the newer flexible type, which means that no lighting equipment is permanently connected to it. Connections are made as on a telephone switchboard, by means of the plugging panel section at the top, with its cords, plugs and receptacles. For school use, this type of switchboard represents a distinct advance over the outmoded conventional switchboard with its stereotyped, inflexible red-white-blue color circuits. Not only does it make possible far more varied and effective lighting results, but also its interconnecting plugging-panel is a feature of great educational value

The flexibility and practicality of the auditorium may be attested by a number of other achievements of the past year. Through space staging and the lighting of the individually controlled acting areas, the eleven scenes of the Christmas Pageant play were actually on stage at one time. In the brief interval of a black-out the scene of action moved from one locale to another without closing the curtain. The 72-foot back-stage area permitted the entire choir of 200 voices to be seated off-stage while a cast of 65 people performed. Thus the eleven scenes with incidental music were presented in one hour and fifteen minutes. Similar staging and lighting enabled the seniors to give their class-day assembly of seventeen scenes in approximately forty minutes. Excellent sight lines and acoustics permit the 1,300 students to see and hear assembly programs comfortably.

When it is realized that this extensive dramatic program is only one of the high-school activities for which the auditorium is used, and that the community and Opportunity School also sponsor heavy programs, one needs no further testimonial to the foresight and wisdom of planning so flexible and adequate a building.

The Head of the Music Department,

HAROLD TALLMAN,

discusses the functioning of the Shorewood Auditorium from the standpoint of musical activities

MUSIC possibilities in such an auditorium as we have in Shorewood are almost unlimited in scope. The rooms are so arranged that all music classrooms and organization headquarters (instrumental and vocal) are housed on the second floor, at the rear of the building. All rooms are of the proper size and shape to accommodate the class or group meeting there, and each room is acoustically treated to give it the correct amount of reverberation for its type of activity.

We have two choir rooms, one with an elevated seating arrangement for the a cappella choir, the other with flat floor, equipped with desk seats, for junior-high music classes and glee clubs. Separate band and orchestra rooms have special storage spaces conveniently located for uniforms and instruments. These two rooms have connecting doors. The doors and the wall between the two rooms are treated with the latest of deadening materials to keep the sound from traveling from one room to the other while rehearsals are being held in both. This arrangement is especially convenient for students playing in both organizations; moreover, it provides for a close relationship between students and directors of the band and the orchestra.

The choir rooms, located on opposite sides of the building, are separated from the band and orchestra rooms by a hallway and the stage fly-loft. Thus there are no conflicting sounds filtering through from either group.

In addition to these rooms we have two piano rooms (9 x 12 feet) equipped for practice and class lessons. These rooms are also available as practice rooms to other music students.

Since the auditorium is a separate and distinct building on our high-school campus, no interruption is caused by sound filtering into academic classrooms; nor does the noise from the gymnasium or manual arts building enter the music rooms.

Opportunity is given to the music as well as the dramatic department, for unlimited production of stage shows, operettas, school assembly programs, and concerts. The convenience of being in the same building, at the back door and down a short flight of stairs to the stage, makes a most desirable set-up for preparing stage programs or working with dramatic productions.

Another point of interest from a musical standpoint is the fact that the auditorium has an orchestra pit large enough to seat an organization of fifty players. Only those instructors who are forced to work under the trying conditions of inadequate room can realize what a boon adequate space really is. We can rehearse our band or orchestra with full instrumentation to help out any musical performance.

Finally, I want to re-emphasize the unity secured through grouping dramatics and music around an auditorium. Both departments are concerned with practically every production in some manner or other, and both departments, housed in the same building, are in position to render prompt and efficient service with the minimum of effort and inconvenience.

The facilities of the Shorewood stage and the acoustics of the auditorium make possible effective musical presentations. The Shorewood A Cappella Choir, directed by Noble Cain, was organized seven years ago. The Shorewood Operatic Chorus presented "The Chimes of Normandy." The accompaniment was played by the Shorewood Orchestra. The United States Army Band gave three concerts to overflow audiences. The Wisconsin Symphony Orchestra, a Federal music project, augmented to full symphony size and directed by Jerzy Bojanowski, Rudolph Ganz and Gabriel Fenyves as guest conductors, gave a series of four concerts. This was followed by a series of three concerts with Orien E. Dalley, Dr. Sigfrid Prager and Frederick Schulte, well-known Wisconsin directors, as guest conductors

The Director of Adult Education,

HARVEY GENSKOW,

describes the educational community activities made possible by the Shorewood Auditorium

THE Shorewood auditorium is a community auditorium. It serves its full function for regular high-school use, but in addition it provides opportunities for Shorewood residents who wish to participate in auditorium activities. The Shorewood Opportunity School conducts a program of adult education and recreation under the supervision of the Shorewood Board of Vocational and Adult Education. Its program covers a wide range of activities, including about one hundred different classes. Many of its activities have been given much more adequate facilities by the addition of the new auditorium. This group may be classified under three headings, as follows.

Dramatics

The Shorewood Playshop is a training school in acting, costuming, make-up, scenery construction, lighting, and staging, for adults. Its membership is entirely voluntary. The dramatic, technical, and costume directors work with the group.

The Shorewood Allied Arts Theater was organized in September, 1936. Membership is by invitation only, and the dramatic director selects his personnel from among the best amateur and former professional players in the city. Its function is to present to Shorewood good plays, the production of which is made possible by the unusual stage facilities of the Shorewood auditorium.

Several informal presentations were made by adult class groups during the season, one of which was a stage review of the work of the speaking-voice classes. These were done for the most part by people with no acting experience, who received a great deal of enjoyment out of their stage debuts.

Music

Several adult organizations operate under the sponsorship of the Shorewood Opportunity School. They all hold their meetings in the auditorium building, and several have given public performances in the auditorium.

In addition to outlets of participation for Shorewood residents, several professional groups were presented during the year.

Lectures

For the past eight years, a series of lectures has been presented Sunday afternoons. These have been made much more enjoyable by the addition of the auditorium. Preceding the program each Sunday afternoon, there is a fifteen-minute program of either community singing led by Frederick Carberry or a music or dramatic program by one of the adult or high-school groups. Following the regular series for 1936-37, four public forum programs were held.

DEVELOPMENTS IN THE SCHOOL RADIO-SOUND FIELD

By I. KEITH TYLER

Bureau of Educational Research, Ohio State University

NUMEROUS schools and colleges throughout the country are now actively engaged in the process of adjusting themselves to the changes which the radio has brought about in American life. Many of them had already made it possible for students to listen to radio programs at school. Indeed, it was not long after radio had sprung into popularity that teachers began bringing receiving sets into their classrooms so that pupils might hear extraordinary events, and this was quickly followed by the provision of such sets by the schools themselves. Often, to be sure, these instruments were gifts of parent groups or service clubs, but not infrequently the school budget was made to cover such purchases. Today, listening to radio programs is but one of many ways in which pupils are brought into contact with radio-sound equipment. An examination of some of the newer developments may indicate the ways in which schools are adapting themselves to this new invention.

Educational Adaptability of the Radio

1. Central-Sound Equipment Is Becoming More Common.—Both in the equipment of new school buildings and in the modernization of old ones, a central program-distributing unit with loudspeakers in the various rooms is becoming an almost-universal practice. This is due quite as much to the greater versatility of such an installation as to economy. With careful buying, the cost is actually less than for individual sets, and the uses to which the equipment may be put are many. Separate radios, on the other hand, can be used only for program listening. Two- and three-channel installations are the rule. A single channel permits but one use of the equipment at a time and results in great inconvenience, as many schools have found to their sorrow. Likewise, schools are insisting on such accessories as large-size turntables for electrical transcriptions, two or more microphones, input mixers, instantaneous recording units, and various other devices for increasing the flexibility of the equipment.

2. Classrooms Are Being Acoustically Treated.—Because listening within the classroom is generally accepted as the most satisfactory practice, these rooms are being treated acoustically so that the programs may be presented without distortion and heard without strain. The ordinary untreated classroom is usually quite unsuitable for reception of programs. The ceiling, the floor, the walls and the blackboards serve as reflecting surfaces that give reverberation and distortion which are not only annoying, but often make it impossible to distinguish spoken words, even with a room full of children. Treatment of the ceiling with acoustic tile or similar material, together with drapes along the sides of the windows, is usually sufficiently effective when the room is well-filled. This not only improves program listening, but makes speaking on the part of teachers and pupils much easier, since they do not need to strain their voices with the usual classroom screech. In buildings not so treated some improvement is made by adjusting the tone control so as to lessen the intensity of the frequencies which are most likely to be reflected. Such an adjustment will not always be effective, however.

3. Radio Programs Are Being Used as Extension of Classroom.—In the early days of school broadcasts, the programs were often of the lecture or direct-teaching type. The radio was used to take the place of the teacher or the textbook for the period of the program. More and more, however, such broadcasts are becoming means for enabling children to have educational experiences which would otherwise be denied them. They are given music by great artists; they hear drama which arouses their interest in a variety of important problems; they listen to first-hand discussions by authorities; they travel by microphone to foreign countries, to coal mines and packing plants, to farms and villages. They experience the struggles of scientists in their fights to conquer disease and ignorance, and they follow the news almost as it occurs. Radio programs break down the isolation of the school walls and bring the whole world into the classroom.

4. Production of Programs Becoming Widespread.—In elementary school, in high school and in college, radio-sound equipment is being utilized for the production as well as the reception of programs. Younger children are appearing before the microphone of the school equipment in informal dramatics, for talks, for round-table discussions, and for the presentation of singing and orchestral groups. High school and college groups are taking part in radio workshops, where they study seriously the techniques of writing and performing by radio. Some of these groups perform only over the school equipment, but others are putting on regular series of programs over local radio stations. In addition to this formal presentation of programs, microphones are being used in speech training and as an incentive toward good speech habits in English classes. School radio work is taking a place in high school and college similar to that of newswriting and journalism.

Reception of news broadcast in elementary school. Students following news items on maps

Social studies and news broadcasts lead to reading of newspapers at home

Reception of broadcast by primary group

Photographs by courtesy of Visual Department, Oakland Public Schools

5. The Demand for Recordings of Radio Programs Is Growing.—So many difficulties face the high-school teacher who attempts the use of radio programs in the classroom as to discourage all but the most ingenious. Classes meet on fixed schedules, and radio programs seldom come at times which fit nicely into them. Likewise, a program which can be used with one class cannot be used with other classes that meet at different hours. Only one solution has been found which seems workable. This is the recording of programs as they are given and the playing-back of the recordings at the time they are wanted. A number of schools have purchased equipment for instantaneous recording and are building up their own libraries of those programs which have proved of most value. A transcription can be used when it is desired, and it can be used again and again, while a radio program comes but once, and seldom at the most opportune time. At the present time such a library of recordings can be built up only if the school has its own equipment for making the transcriptions. It is probable that educational recordings will be made in quantity by commercial companies if the demand warrants the necessary investment in the venture. No wide use of sound materials at all comparable to visual materials on a high-school level can be expected until recordings are available at a reasonable cost.

6. Educational Listening at Home Is Being Encouraged.—While the difficulties of school listening are great, home listening offers few problems. Many high-school teachers are suggesting as a part of the pupil's home work that he listen to selected educational programs to be discussed or reported upon in class the next day. Nearly all pupils have radios in their homes, and very helpful programs are available nearly every evening. It is only necessary that the teacher know about these programs in advance and inform the students about them in class that day. Many teachers believe that such assignments are quite as valuable educationally as are similar assignments to books, magazines, or other source materials.

7. Listening-Discrimination Is Being Taught in Many Schools.—Many teachers, conscious of the fact that their pupils are listening to the radio two or more hours daily, are feeling the school's responsibility for giving listener-guidance. They believe that through discussion of programs and encouragement to listen to new programs it is possible to lead students to formulate standards for listening. Such discussion may grow out of assigned educational listening, or it may come through a consideration of radio programs listened to for entertainment. It makes the students conscious of the factors which influence their present choices, and often leads to marked growth in the maturity of the standards which they apply in judging programs. They become intelligently critical of such things as cheap melodrama, misrepresentation in advertising, and the like. In many high schools such a study has become a regular unit in an English course. In other schools it comes in frequently in class discussion or is dealt with in a radio club or other special activity.

8. Radio Education Is Being Given Administrative Recognition.—The importance of radio in education is being recognized in many of the larger school systems by the inauguration of a department of radio, the appointment of a director of radio, or the creation of a special staff to deal with the problems of producing and utilizing radio programs. Where the school utilizes programs without producing them, this department often prepares a list of worth-while educational programs, which goes out to the schools each week in order to give each teacher an advance notice of the broadcasts which he may find useful. In addition, the department is responsible for training teachers in using broadcasts through the distribution of bulletins, for conducting conferences and demonstrations, and for serving as consultants in solving special problems. When the school system produces its own programs, the radio staff is responsible for the planning and production of these programs in cooperation with the appropriate members of the supervisory and teaching staffs. This may require a number of persons trained in such fields as script-writing, radio dramatics and direction, and program planning.

9. Teacher-Training in Radio Use Is Being Extended.—The more general use of radio programs in schools is held back by the lack of adequate training on the part of teachers. Pennsylvania now requires such training on the part of those now qualifying for teaching-certificates, but other states have not yet recognized radio to this degree. More courses were offered in teacher-training institutions in the summer of 1937 than ever before, and the interest of teachers now in service appears to be growing. Demonstrations and discussions dealing with radio use are appearing more frequently on the programs of teachers' meetings and conferences, and the opportunities for teachers to secure help are greater. The combining of radio and visual aids to learning in a single course seems to be the most practical attack in the smaller teacher-training institutions.

10. Schools May Have Their Own Stations.—The opening of ultra-high frequencies for broadcasting may make it possible for the larger school systems to have their own broadcasting stations without interfering with commercial programs. Cleveland has already applied for one of these frequencies in order to experiment with its use for school broadcasting. The special nature of these frequencies, which give satis-

Current events broadcasts do much to stimulate geographical study

Discrimination in home listening is developed through intelligent use of broadcasts in the schoolroom

High-school group receives news in the classroom via radio

Photographs by courtesy of Visual Department, Oakland Public Schools

factory reception only for local areas, seem to make them ideal for local school systems. The outcome of the Cleveland experiment, if the frequency is granted, will indicate the possibilities of this development and will probably mean, if successful, a widespread adoption of the plan.

The ten developments which have been described in this brief fashion all point to a greater use of radio-sound equipment in school and college. To neglect this field and its possibilities is to deprive pupils of many important educational opportunities. Provision for equipment can be made most adequately at the time when a new building is being constructed or an old one altered.

MODERN EDUCATIONAL APPLICATIONS OF RADIO-SOUND EQUIPMENT

By R. R. LOWDERMILK

Bureau of Educational Research, Ohio State University

—I.—

ANY inquiry into the use of radio and associated electronic equipment by schools and other educational institutions reveals two striking trends—a rapidly growing preference for centralized equipment as opposed to individual radio receiving sets, and a steadily mounting interest in the potential applications of such equipment to pupil-activity work and drama production. Though the relationship between these two trends is very close, it would be difficult to judge whether one is a cause and the other an effect, or whether the two have developed side by side as the results of other factors.

When the public-address system, the forerunner of the modern school program-distribution unit, first made its appearance in the classrooms of America, about the year 1927, it came in purely as an expedient in the direction of economy, to be sure. Popular curiosity and interest, by that time, had reached a point where radio-listening facilities were desired for each classroom. Yet a receiving set for each room was out of the question because of ever-present budget limitations. True enough, a number of schools had sought to extend the listener coverage of their one or two radio receivers by connecting several loudspeakers to each set, but difficulties arising from electrical mismatching, inadequacy of audio power, and circuit overloading, soon demonstrated the impracticability of this procedure. Hence it was that the advent of the audio-frequency amplifier, or power amplifier, as it is popularly called, was hailed by schools as the ultimate solution to the problem of providing adequate program-listening facilities. With its use, the program signal from the radio receiver could be built up to a power level sufficient to operate any number of classroom loudspeakers.

It is significant to note, however, that the audio-frequency amplifier, having been developed primarily for public-address use, brought with it two accessory devices which were destined eventually to extend teaching applications of radio-sound equipment far beyond that of broadcast reception and distribution for school listening. These devices, it will be recalled, were the electric phonograph and the microphone. From the very beginning, the microphone captured the imagination of school administrators, teachers, and pupils alike. Who, at that time, was not intrigued by the notion of broadcasting? For that matter, a decade of use has brought about no apparent abatement in this interest.

The Fascinating and Versatile Microphone

In the field of public instruction, where every innovation must necessarily be justified to the taxpayers and a board of practical business men, the microphone could be justified as an administrative convenience. If the school principal, in the beginning, disrupted the work of classes with too-frequent announcements, or occasionally tried the patience of his "unseen audience" with choice bits of inappropriate humor, we cannot be too harsh in condemning him. It seems to be just one of the vagaries of human nature to revel in the release and control of power and the enhancement of subjective importance it gives, whether it be the accelerative power of a modern automobile or the power of a microphone to project the voice beyond immediate visible limits. Teachers, too, soon found occasion to use the school microphone—a bit timidly, perhaps, but covering their eagerness with a brave attempt at nonchalance—announcing the forthcoming game, the playground activity schedule, tomorrow's candy sale, or new books added to the library. Pupils required no second invitation to get them before the

microphone. Potential "Barons" and "Sharlies," "Sams" and "Henrys," and "Mrs. Pennyfeathers" were only too willing to burlesque their radio favorites over the school sound system.

However, before the novelty of this new type of equipment had yet had a chance to wear off, foundations for sound educational applications were being laid. Either the principal learned to use the microphone sparingly and effectively, or his successor did so. All routine announcements were reserved for a special period, so that it was no longer necessary to interrupt classes except in rare instances when emergencies occurred. Teachers quickly learned to turn the broadcasting aspirations of their pupils to account in motivating class work. From allowing pupils writing superior compositions or reports to repeat these over the school microphone as a reward for achievement, it was but a step to using the school sound system for broadcasting interviews, reports, debates, round-tables, and classroom playlets to other class groups engaged in the study of related topics. Drama classes, also, turned to the school microphone where auditorium-stage facilities were either lacking or inadequate. Here was a new instrumentality for dramatic production which, because it did not require tedious memorization of dialog parts, or the collecting of stage properties and costumes, or long hours of rehearsal, was sufficiently economical in terms of pupil time and effort to be used freely without the danger of crowding other things out of the already-overloaded schedule.

The Electric Phonograph Pick-up

Less picturesque, perhaps, but no less important than the educational acceptance of the microphone, has been that of the electric phonograph, or, to be a bit more exact in designation, the electric phonograph pick-up. At the time schools first began using centralized sound-distribution systems, many of them had already accumulated collections of phonograph records for use with the older, acoustic-type phonographs in teaching music appreciation. It will be remembered, too, that, a decade ago, relatively few concerts usable for teaching appreciation were available on the air. It was but natural, then, that previously-acquired record collections should have been reproduced over the school sound system for appreciation listening. New, electrically-recorded phonograph discs gradually replaced the older records, and playback quality was correspondingly improved. The reproduction of phonographic recordings continues today to be an important use of radio-sound equipment.

Like its companion, the microphone, the electric phonograph has suffered some misuses at the hands of teachers and school administrators. Fortunately, the Sousa marches and the Merry Widow Waltz became a bit too scratchy to be of further service and were discarded, so that now, instead of having to march in and out of buildings to the martial rhythm of the former, or practice direct ovals or touch typing to the softer rhythm of the latter, present-day boys and girls enjoy concerts from recordings during lunch hour, play musical games or perform rhythmic exercises to the accompaniment of recorded music, or use phonograph records to furnish music for school dances.

The history of activity uses of school program-distribution equipment may reveal inadvertent blundering here and there, but, at last, this phase of equipment utilization seems to have established itself along fairly substantial lines. In the main, activity uses have developed principally by trial and error, rather than through deliberate analysis of the educational potentialities of this kind of equipment. A certain technique is tried out in one school and found to yield worth-while results. It is discussed at a regional teachers' institute or, perhaps, described in a published article. Other teachers decide that it has possibilities of helping them to attain objectives toward which they are working. They give it a trial, probably making certain alterations or refinements to adapt it to their own teaching situation. In consequence, new techniques are evolved.

The Development of New Uses

Equipment improvements, too, have had an important influence in extending the range of teaching applications of centralized radio-sound systems. A school administrator learns of some interesting use of radio-sound equipment which has proved successful in another school. In order to put it into practice in his own school system, his present equipment must be modernized. The greater versatility of use which results from rebuilding his equipment makes possible still other applications than the specific use he originally had in mind. One of his teachers gets a hunch. More trial and error procedure follows. A distinctly new and different use of radio-sound equipment is developed. Possibly the administrator describes it for others in an article of his own!

Analogous to the illustration of the man and the bear chasing each other round and round the mountain, we have, in radio utilization, the spectacle of local experiment in the use of equipment and new developments in equipment design, each spurring the other on to still greater achievement. Whenever the equipment manufacturers make some outstanding improvement in their products or bring out some new accessory device, new teaching applications are sure to follow. These new uses reveal certain equipment inadequacies, and the manufacturers must again improve the design or quality of their products.

If school people who are using radio-sound equipment were sufficiently familiar with the technical aspects of radio to be able to foresee all its potential applications to teaching, they would be able to specify the exact details of construction necessary for accomplishing these things, and manufacturers could build exactly the kind of equipment schools need. Manufacturers, on the other hand, having had no specialized training in the field of education, are unable to foresee the specific points in the entire educational program where radio-sound equipment might be used to advantage, so they have to guess at what schools want. Unfortunately, neither side seems able to give the other a great deal of assistance. Thus the whole process continues, merry-go-round fashion, first one and then the other leading.

—II.—

The development of activity, production, and administrative uses of radio-sound equipment has been briefly traced from their earliest beginnings. It has been pointed out that these uses developed because teachers have seen, in radio, an opportunity for accomplishing more readily the kinds of objectives with which the school is concerned. It has also been shown that these teaching applications of sound-distributing equipment have grown directly out of the propensity of teachers for experimenting with new techniques in utilizing the interests and abilities of boys and girls as the point of departure in instruction. What specific uses, aside from that of distributing programs received from the air, or programs reproduced from phonograph records and electrical transcriptions, to listener groups, are being made of radio-sound equipment in the modern school? Their number is legion. Roughly, they may be grouped into three classifications: those dealing with administration and supervision; those having to do with production; and those relating to the analysis of performance.

For Administration and Supervision

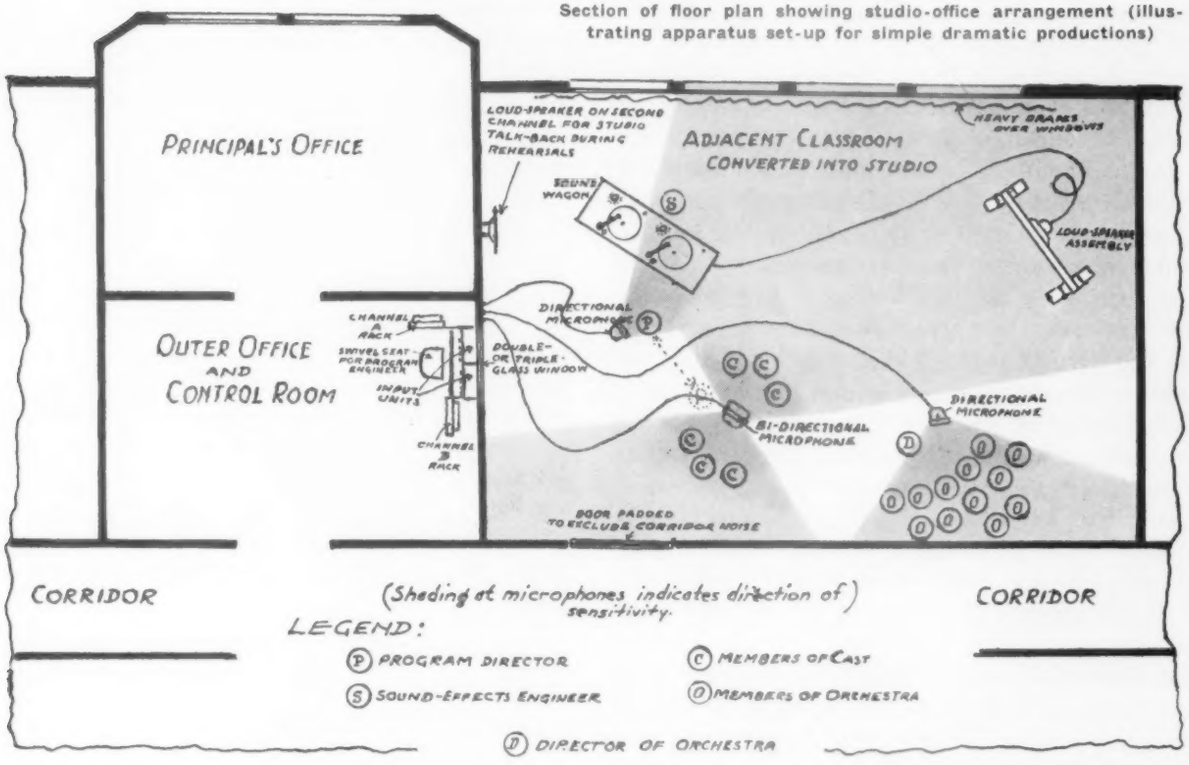
The office microphone still constitutes an important link between the superintendent or principal and the student body. Routine announcements are made regularly at a convenient period when no classes will be disturbed. Matters of school policy involving official actions of the board of education and the relationship between the school and its community are explained to students and faculty. Outstanding individuals of the local community explain their views on current issues to the student body, or discuss the vocational opportunities of various trades and professions. Special-subject supervisors use the microphone to make contact with departmental groups, either in calling attention to special problems in their respective subject areas, or in commenting on radio and transcription programs to which these groups have listened. The office microphone still finds occasional use for emergency announcements and directing fire drills, but these are usually kept down to a minimum.

Production Uses

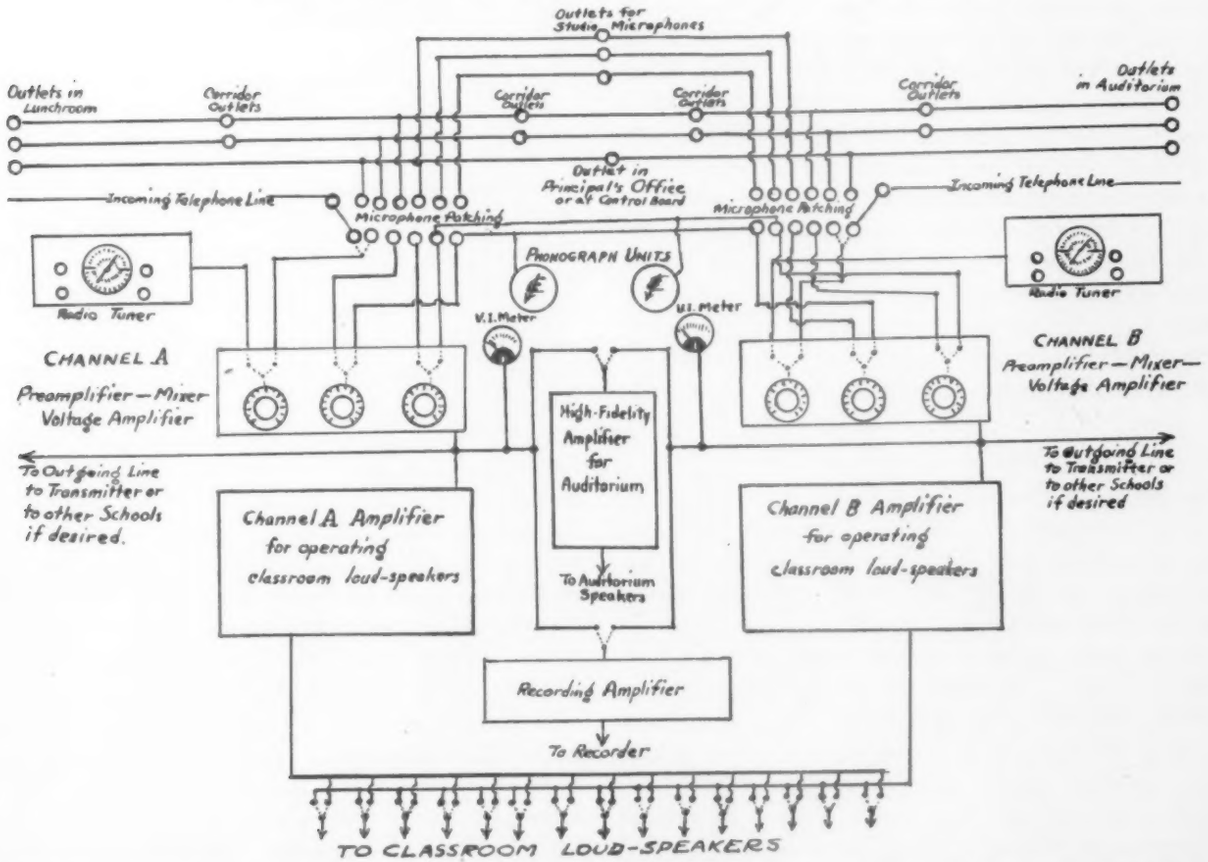
In the consideration of production uses of radio-sound systems, a number of equipment difficulties are encountered. The customary practice among companies producing standard program-distribution units for the school market is to provide each program channel with an input-selector switch by means of which either a radio broadcast, a phonograph-record reproduction, or a program or talk picked up by the microphone, may be fed into the power stages of the system at any one time. A few manufacturers provide for blending any two of these three classes of input signals. For drama or large-group broadcasting over the system this input arrangement is wholly inadequate. From two to four microphones are required simultaneously in drama production, depending on the size of the cast used, and depending on whether or not an orchestra or vocal group is being used as part of the program. Further, provision must be made for allowing the sensitivity of each of these microphones to be varied continually throughout the program in order to maintain proper program balance. The older, input-selector switch provides for the use of a single microphone. Hence, a more recent device known as the input mixer, taken over from the field of radio broadcasting, must be used instead. Most manufacturers of school equipment are able to supply the input mixer in place of the input-selector switch where it is specifically requested.

School radio-drama production again brings the electric phonograph into prominence as a means of reproducing recorded sound effects. Most of the standard school sound units on the market incorporate an electric phonograph as a part of the unit, but this is hardly adequate for drama production, since better production techniques require that the cast be able to hear the playing of these sound effects in order to time their dialog parts accurately. Hence it is preferable to use a modern version of the electric phonograph known as the sound wagon. A satisfactory sound wagon may be constructed easily by mounting two or three electric phonograph units on the top of a small table fitted with silent castors. A mixer arrangement provides for blending two or more signals from the phonograph units and feeding them into a power amplifier mounted underneath the table, while a detachable cable carries the amplified signal to a separate, portable loudspeaker unit. By using a simple plug-in arrangement, the sound wagon may be wheeled into the office or control room and connected directly to the central radio-sound unit for playing recorded pro-

Section of floor plan showing studio-office arrangement (illustrating apparatus set-up for simple dramatic productions)



Below—Schematic diagram of a two-channel all-purpose program-distribution unit



Illustrations on this page and on page 365, reproduced, by permission, from experimental edition of Lowdermilk, R. R., "Radio-Sound Equipment For Educational Use," Columbus, Ohio: Bureau of Educational Research, Ohio State University. 1937.

grams over the system for such uses as music appreciation, rhythmics, musical games, and dances.

Production and activity uses of centralized radio-sound systems represent both wide variety and application to a number of subject areas. Upper-grade girls of the English class may put on a daily story hour for the primary grades. Upper-grade pupils in social studies or English classes may provide a daily or weekly news review. Book reviews often take the form of playlets which are broadcast to other class groups. Interviews, reports, panel discussions and simple dramatizations based on current problems may be broadcast by social-studies groups to other classes. A summarization of an entire historical epoch may be dramatized in the form of a historic pageant. Verse-speaking choirs may use sound effects and musical background to advantage in highly dramatic broadcasts over the sound system. Orchestral and choral groups may broadcast concerts and recitals which can be used for appreciation listening or for entertainment.

Now that local transmitting stations, here and there, have invited schools to provide regularly scheduled programs to be broadcast on the air, in-school broadcasting has taken on added significance. Not only does this give pupils the experience of organizing materials into form for effective presentation, and the creative experience involved in presenting it, but it serves to inform the community regarding the work going on in the school, when they are able to listen in their homes to such programs. Certain difficulties, however, are involved in transporting students to and from a radio station for rehearsals and for broadcasts. Where the quality and design of the school sound system will permit, programs originating within the school can be "piped out" over telephone lines to the transmitting station. This not only saves a great amount of time and effort on the part of pupils and teachers, but it enables the pupils to work in the same atmosphere of security and familiarity to which they have been accustomed.

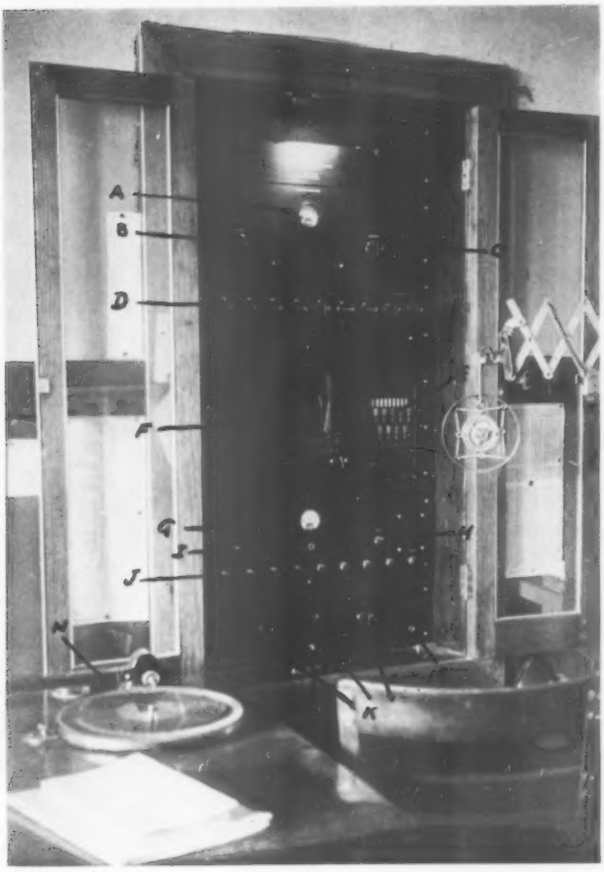
Analysis of Performance

The use of radio-sound equipment in the analysis of performance began, informally perhaps, at the same time that pupils were first introduced to the school microphone. Assuredly, any pupil appearing on a school broadcast wanted to know "how he went over." Of course other pupils told him—often in none-too-flattering terms! As pupil broadcasts came to be accorded "educational respectability," more attention was given to presentation techniques. Correct enunciation, careful control of breathing and effective placement of emphasis were studied. Pupils preparing to appear on broadcasts often rehearsed their presentations over the microphone while the rest of their group listened over the classroom speaker and made note of items which needed further attention. The advent of instantaneous recording as a part of the school sound system has carried this use a step farther. Now each person is able to hear himself as he will sound to others listening in over the loudspeaker. Speech classes are finding this feature particularly useful in the study and analysis of speaking difficulties. Recording of musical groups is very helpful in revealing exactly where improvement is needed, since they can be recorded to show the total effectiveness of their performance, or the frequency ranges of particular sections of instruments or voices may be emphasized. The instantaneous recorder has so many other possible uses, such as recording interesting activity programs for purposes of record and comparison, and transcribing radio broadcasts which are offered at hours inconvenient for class-group listening, that no school can afford to overlook its educational potentialities.

A Constantly Growing Instrumentality

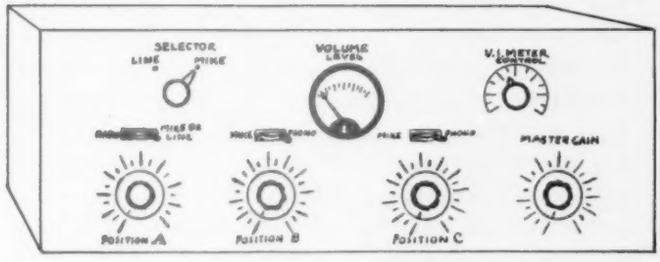
This by no means exhausts the list of uses schools are making of centralized radio-sound equipment. Many minor variations of the uses described might be cited. Doubtless there are still other unique uses which have never been publicized outside their immediate localities. New developments in equipment design are appearing all the time, and, unquestionably, these will suggest still other teaching applications. Production and activity uses have not only become fairly well established, but it seems a reasonable assumption that they may be expected to take on increasing significance as curriculum objectives continue to be re-stated in terms of pupil growth and activity.

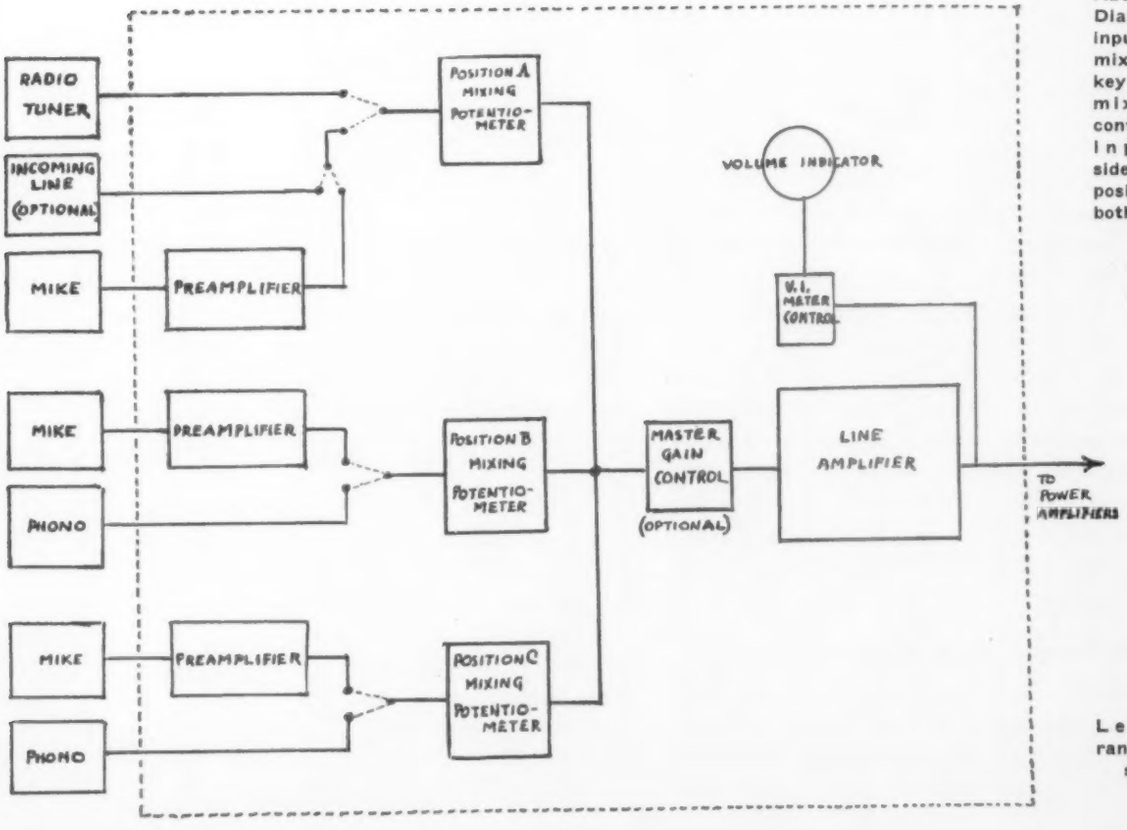
There has been no intention to minimize the value of radio-sound equipment as a means of receiving and distributing programs from the air for school listening. Educational leaders are coming to examine more critically the possible advantages of radio-broadcast listening as an instrumentality for expanding the range of useful knowledge, for broadening and enriching the content of understandings, for directing interest into new channels of inquiry, for developing critical skepticism, and the like. A number of experimental studies are now in progress which seek to discover the educational effectiveness of radio-program listening in schools. This does not mean that program reception and distribution will necessarily take precedence over activity and production uses of radio-sound equipment. The latter has become much too firmly grounded to be laid lightly aside. What is more probable is that equipment design in the future will need to make additional facilities for both types of use.



The La Vergne School at Berwyn, Illinois, is still using this two-way school radio-sound unit, claiming it as the first of the sort ever built. Constructed jointly by the principal, upper-grade pupils, and parents of the district, it was officially dedicated April 18, 1928

The letters have reference as follows: A—volume-level indicator; B—amplifier gain control; C—equalizer for acoustical correction; D—controls for classroom loudspeakers; E—automatic tuning control; F—radio tuner; G—microphone-current meter; H—preamplifier switch; I—selector switch for coupling phonograph to any one of three mixer positions; J—selector switches for coupling each of ten microphones to any one of three mixer positions; K—three-position mixer; L—master power switch; M—power take-off for recorder; N—phonograph unit





Above—
Diagram of a speech-input unit with three mixing positions. The key switch above each mixing potentiometer control selects either of inputs designated in side positions; in center position of each key, both of these inputs are disconnected

Left — Schematic arrangement of above speech input unit

ADMINISTRATION OF THE VISUAL INSTRUCTION PROGRAM IN SCHOOLS

By J. E. HANSEN

Chief, Bureau of Visual Instruction, University of Wisconsin

WHEN consideration is given to the value received from a well-planned and properly executed program of visual instruction, the necessary expenditure will seem but nominal. An average annual per-pupil expenditure of from fifty cents to one dollar will probably bring greater returns than any other like expenditure. It is as essential to make provision in the budget for the purchase of projection equipment and for the rental of motion pictures, lantern slides, etc., as it is to make provision for any other equipment or materials. Failure to make such provision denies the pupils of the respective educational systems the right to benefit from the latest and most effective aid to learning. While many school administrators and boards of administration have so far hesitated to make the necessary financial provision for its use, the very efficiency of the screen picture as compared with other devices will compel its general adoption for everyday classroom use, just as the textbook is now used.

Many of the administrative details connected with visual instruction require a closer study and more time than most teachers can afford from their regular classroom duties. The successful administration of a visual instruction program requires a technical knowledge of the mechanics of picture projection, an acquaintance with the various types of projection equipment, and with the various sources of materials, and other important details. For the efficient administration of the local program the following suggestions are offered.

The Director and His Duties

A practice which has proved successful in some schools is that of placing a teacher with a reduced teaching load in charge of this work. A good choice for this is a science teacher or some other person with sufficient technical knowledge and administrative ability. In large school systems a full-time director with the necessary clerical and technical help should be provided.

Ordering Visual Aids and Equipment.—The local director should acquaint himself with all the various sources of visual aids and should be in a position to inform his teachers as to the availability of the materials which they need. He should keep abreast of the advances made in all phases of visual instruction so that he can recommend the type of equipment to purchase and offer suggestions as to where the latest and best pictures may be secured. He should be so qualified and so prepared that he may at all times act in an advisory capacity in the purchase or rental of materials. His office should serve as the channel through which all materials may be ordered.

FILMS SCHEDULED FOR THE WEEK OF ——

DAY	TITLES OF FILMS	BY WHOM ORDERED
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		

Chart 1

When films and other aids are rented from outside sources, it is desirable to get the maximum use out of them. Often materials ordered by one teacher or by a department may suit the needs of other departments. It is suggested that materials ordered for each school be listed on the office bulletin board a week in advance, so that all teachers may be informed of the materials that will be available. The form reproduced in Chart 1 is suggested.

Another duty of the local director would be that of maintaining a record of all motion pictures shown in his school system. New films might be previewed by the director with the aid of interested faculty members. An evaluation of each film could be made on a card similar to the one given below. These cards would then form a permanent record for the use of other members of the staff. In time a comprehensive file of motion-picture information would be available for the use of the whole teaching staff.

CRITERIA FOR EVALUATING FILMS

NAME OF FILM: _____ PRODUCER: _____

SOURCE OF FILM: _____ TYPE OF FILM: _____

I. *Teaching Effectiveness*
1. Is the film up-to-date? _____ If not, indicate any points where it is not.
2. Is the film accurate? _____ If not, indicate any points where it is not.
3. For the teaching purposes indicated, does the film fit the maturity level of: a. Elementary students? _____ b. Junior high school? _____ c. Senior high school? _____
4. Is the film too long? _____ Too short? _____ Just right? _____ Comment:
5. Degree to which film presents new materials of information:
6. Probable interest of film to various age levels:

II. *Mechanics of the Film*
1. Clarity of objects and scenes:
2. Adequacy of close-ups:
3. Sound quality:
4. Titling:
5. Vocabulary:
6. Organization (coherence, sequence):

III. *Administrative Factors*
1. Price: Satisfactory _____ Unsatisfactory _____
2. Nature of advertising (if free film)
3. Conditions under which film is obtainable:

Chart 2

Making the Best and Widest Possible Use of Available Equipment.—In one large junior high school, the local director has worked out an ingenious method for making the school's four motion-picture projectors available among the fifty or sixty teachers in the building. Each week a chart with spaces for each day and hour of the following week for the four projectors is posted. On this chart each teacher indicates the day or days and the hours during which he wishes to use one of the projectors. Thus the maximum use is gotten from each projector, with the greatest benefit to all concerned. With each projector goes a screen which may be mounted on books conveniently placed in the front of each classroom. Similar methods can be worked out for handling other materials also.

Instructing Local Teachers.—The local director should acquaint himself with the best visual aids teaching techniques and should strive to improve visual instruction in his classrooms as regards both the pedagogic and the mechanical aspects.

Photography holds so many possibilities for the teacher that it seems a course in elementary photography ought to be included in every teacher training program. The photographing of interesting and important events, objects, and places for the production of lantern slides for instructional purposes; the making of photographic records of trips and tours; and the making of photographic records of interesting phases of school life, are but a few of the uses to which a camera in the hands of the teacher may be put.

Advantages of Centralized Control and Responsibility.—Projectors and other materials are in constant need of expert care, and unless some one person is held responsible for their care, they will soon get into such a state of disrepair that they will have little value. It is also essential to centralize the responsibility for the routing of materials and equipment and to see that they are promptly returned.

Classroom Facilities and Standards in Visual Instruction

At the present time one of the greatest obstacles to the proper utilization of screen pictures in classroom teaching is the lack of necessary classroom facilities. Despite all that has been said and written on this subject, we still find almost every school lacking most of the facilities necessary to the successful use of screen pictures as teaching aids.

Lantern Slide Projector.—Certain standards in projector construction should be adhered to. Lantern slide projectors should be equipped with large objective lenses approximately 2½ inches in diameter. Smaller lenses do not give satisfactory results. For the average classroom the focal length of the lens should not be more than 12 inches nor less than 10½ inches. A greater focal length than 12 inches will not allow a screen picture of sufficient size; too short a focal length will prohibit a flat screen picture. Within these limits of focal length a picture can be produced without distortion that can be brought sharply in focus at all points. A 500-watt lamp is probably most satisfactory for classroom projection of lantern slides. A

PROJECTOR BOOKING RECORD

PROJECTOR _____ WEEK OF _____

(Write name and room number for period desired)

Period	Monday	Tuesday	Wednesday	Thursday	Friday
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

Chart 3

stronger light is likely to crack the slides because of excessive heat; a weaker light will not give the intensity of light needed. The projector should be equipped with a handle and should be easily portable. Bulky combination lanterns are not convenient for regular classroom use.

Motion Picture Projector.—For 16-mm motion-picture projection, direct illumination should be insisted upon. Very satisfactory projectors with 750-watt lamps are now available. Smoothness and quietness in operation should also be sought. The focal length of the lens should be such as to provide a picture not less than 3 by 4 feet for the ordinary small classroom. The latest model of any make should be purchased, since improvements are being made constantly. The latest model of any of the standard makes will give satisfactory results for classroom use. School men should always keep their eyes open for improvements and for new models and new makes.

Before purchasing a projector of any kind, the prospective user should give it a personal trial under the very conditions in which it will be used in the classroom. A personal trial with films or slides of one's own choosing, under the conditions ordinarily prevailing in the classroom, will insure the selection of the best projector. In any projector trial, the proper distance of the projector from the screen, and a sufficiently large image, should be given consideration. In a slide demonstration, slides of varying degrees of density, slides of significant detail and with considerable tone gradation, and colored slides of considerable variety, should be tried. In trying out a motion-picture projector, one should also make certain that satisfactory results can be obtained from films of various kinds under classroom conditions. In fairness to the projector under consideration, a satisfactory screen should be used in all trials.

Projection Table.—A projection table should also be provided in the classroom. For daily classroom work there should be a movable lantern stand with each lantern. This stand should be high enough to bring the lantern above the heads of the pupils, and narrow enough to be placed in the aisle if necessary so as to be easily moved about. It should have small wheels or casters under two of the four legs. A shelf placed not too far below the top will be found convenient for holding slides, films, containers, etc.

The Screen.—First of all, a screen should have a good reflecting surface. For this reason an uncoated screen, such as one made of uncoated muslin, should be avoided. The surface of a screen should give proper diffusion so that the light will be reflected evenly to all parts of the room. The most satisfactory screen for classroom use is one of heavy bleached muslin which has been properly glue-sized and surfaced with a coating of flat white paint. Beaded and metal coated screens are not so satisfactory because they do not reflect light evenly to all parts of the room. They produce a brilliant image within a small angle directly in front of the screen, but reflect the image poorly to parts of the room outside this small angle.

Size of Image.—For the average classroom, the screen should be about 6 feet square and mounted on a spring roller. A good rule to follow is to have the dimension of the screen not less than one-fifth nor more than one-fourth of the length of the room. The height should always equal the width, for in lantern slide projection many of the slide pictures are taller than wide. For the average classroom, the screen image for still pictures should range from 5 feet to 6 feet across. The greater dimension (most often the horizontal) of the still screen image should not be more than one-fourth nor less than one-sixth of the distance from the screen to the farthest student. For motion pictures, the width of the image should be between one-sixth and one-seventh of the distance from the screen to the farthest student.

We cannot stress too strongly the importance of a screen image of sufficient size. The instructor ought to make a practice of occasionally viewing the screen picture from various angles at the sides and the rear of the room to make certain that the details of the picture may be seen by all members of the class.

Location of Screen.—The screen should be suspended from a place higher than the top of the average blackboard, so that the bottom of the picture will not be too low to be seen by the pupils in the back seats. The bottom of the screen, when the screen is down, should be between 3 and 4 feet above the floor.

Daylight Screens.—The so-called daylight, or translucent, screens are not entirely satisfactory for classroom use. For large classroom use they are too small to allow the detail of the picture to be studied by the pupils seated farthest from the screen. A daylight screen of large size would be impractical because of the distance back of the screen at which the projector would have to be placed. A projection lens of sufficiently short focus to allow a picture of 4 to 6 feet to be thrown on the screen from the rear side would not give a flat field.

Shades.—Dark shades should be provided at all windows. The clearness and brilliance of any screen picture are determined largely by the relative amount of light which comes from the projector. The greater the proportion of light which comes from sources other than the projector, the poorer will be the quality of the picture. Black, green, or other opaque shades should be provided on all windows. Such shades should be on rollers and made to cover the whole window. Shades made to run in grooves are as a rule unsatisfactory. The most satisfactory shades are

made to run on the face of the casing, and wide enough to project about 3 inches beyond the inner edge of the casing on both sides. This overlap allows little light to pass between the casing and the shade. Such shades will be cheaper to install, will last longer, and will be much easier to operate than those which are supposed to run in grooves *but seldom do*. The cost of installing plain shades is very moderate.

Electrical Outlets.—Electrical outlets should be provided in all classrooms. The necessity of having a convenient one in the rear of each room should be obvious. Teachers should not take up valuable class time in connecting up the lantern to some almost inaccessible outlet. They should not be expected to run extension cords to outlets in other rooms. An outlet should be so located in every classroom that the projector may be connected in a moment; it should be located in such a manner that the pupils will not trip over the cord. If it is necessary for teachers to disconnect all the other lights in the room and to use a stepladder to connect the projector, they will not take kindly to screen pictures.

Transferring Children to the Auditorium.—The transferring of children from the classroom to the auditorium should be avoided if possible. It causes conflict between classes wishing to use the room at the same time; it is likely to destroy the classroom or study atmosphere and create a frame of mind which demands entertainment instead of work; it makes difficult the use of other necessary aids, such as writing materials, blackboards, globes, etc.; it wastes much valuable time of all the pupils; it tends toward the presentation of too much pictorial material within one interval of time, and in general prohibits good teaching technique; and it also discourages and practically prohibits the use of pictures at the proper moment in the presentation of a subject.

Another practice common in some schools is to transfer classes to a special classroom which is equipped with dark shades, electrical outlet, and a screen, for picture presentation. With the exception that more suitable desks may be available in such a special lantern room, all the objections to using the auditorium apply to this practice also.

The Care of Equipment

Films and Slides.—Films and slides should be properly taken care of. To insure the best screen results, lantern slides should be kept clean and free from finger marks. Films should be kept in metal containers at all times when not actually being projected. This will prevent their drying out and becoming brittle. Where films are owned locally, humidor cans with a special preservative solution may be used to keep them soft and pliable.

Projectors.—Proper care should be given to all projectors. Many projectors are not rendering satisfactory service because dust and dirt have been allowed to accumulate on them; their reflectors have become corroded and are out of alignment; their lamps are carbonized and otherwise dirty, and are not properly adjusted; and, in the case of motion-picture projectors, excess oil and dirt and film emulsion have been allowed to accumulate on the film track, on the sprocket wheels, and in the gears. All these things can be prevented by the proper attention.

A new lamp should be installed as soon as the old one becomes excessively carbonized. The lamp should be kept clean and bright and properly adjusted and aligned with respect to the optical system. The reflector should be kept clean and in careful adjustment, and should be replaced when the reflecting surface becomes corroded. The condenser lenses and the objective lens should be kept clean by wiping them with a clean, soft cloth or with a special lens paper.

The film track and the mechanism of the motion-picture projector should be kept clean and the bearings oiled regularly. All excess oil should be wiped off after oiling to prevent its spreading and eventually getting on the film. Worn sprocket wheels should be replaced, and the shutter be kept in adjustment to insure steady and flickerless projection.

It is surprising how a little care will improve the quality of picture projection.

INTERNATIONAL PROJECTOR CORPORATION

88–96 Gold Street, New York, N. Y.

Simplex PROJECTORS
INTERNATIONALLY SUPREME

SUPER SIMPLEX PROJECTORS AND SIMPLEX SOUND PROJECTORS TYPE SP

Standard professional 35 MM motion picture equipment for Theatres, Auditoriums, Schools, Colleges, Churches, Hospitals, Private and Public Institutions, etc.

We realize that the purchase of motion picture equipment requires long and serious consideration and advertisements, correspondence or even catalogs are ordinarily inadequate. In many instances decisions cannot be quickly made and it is, therefore, highly desirable to have information personally supplied by representatives of the National Theatre Supply Company, Distributors of Simplex Projectors, with Branches throughout the United States. We are also represented in foreign countries and would like you to write to us for the names and addresses of any of our distributors.

Our wide experience enables us to understand the needs of schools, colleges, churches, hospitals, private and public institutions, etc., and where there is no technical advisor to guide in the selection of equipment the complete line of 35 MM Simplex Projectors places us in a position to impartially advise regarding the kind of equipment best suited to meet the specific requirements of any proposed installation. Projection Room Plans and information regarding installation of motion picture equipment will be supplied to architects and others upon request.

For over a quarter of a century, a period which covers almost the entire commercial history of the motion picture industry, the products of this company have held an unquestioned, outstanding leadership wherever motion pictures are shown and enjoyed. In New York, Chicago, Los Angeles, London, Paris—the great cities of the world—Simplex Projectors are installed in the largest and finest motion picture houses, and are extensively used in South America, Asia, Australia, Africa, as well as throughout North America and Europe. Over twelve hundred theatres in England, Ireland and Scotland alone are equipped with our products. These facts we believe definitely substantiate our claim "Simplex—The International Projector." Simplex Projectors are used in thousands of rural communities throughout the United States and Canada as well as in the larger cities where superior projection is necessary and dependability is essential. The universal appeal of motion pictures has been made possible and practical for over twenty-five years very largely through the engineers and mechanical staff of this company. Governments, the Army and Navy, great commercial organizations, universities, churches, and other institutions have used Simplex Projectors exclusively for many years. More recently the finest Trans-Atlantic and Pacific Liners have installed Simplex Projectors for the entertainment of their passengers.

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Men, Methods and Materials

Many of the men in our plant have been with us from fifteen to thirty years, and have had extensive experience in the design and construction of motion picture projectors. This is of utmost importance as motion picture projectors must be designed and built with a thorough understanding of the practical difficulties of the motion picture field as well as the technical problems.

Scientific Accuracy

Although Simplex Projectors are made with scientific accuracy and projection involves a knowledge of mechanics, electricity and optics, utmost thought has been given to the importance of having our machine simple and dependable. Very satisfactory results can be obtained even by those who have not the skill and knowledge required in order to secure the quality of screen presentation demanded in large motion picture theatres. In the hands of a projectionist with the necessary technical knowledge, Simplex Projectors will meet all reasonable requirements under any conditions. We definitely claim that no other organization is so completely equipped for the manufacture, testing and checking of sound and visual motion picture apparatus.

Simplex parts are made from carefully selected raw material, and this also involves an intimate knowledge of the highly specialized requirements of this field. Every part used in the manufacture of Simplex Projectors is made in our own plant, and whenever required in order to secure greater ease of operation and longer wear all parts are specially hardened and ground. Satisfactory screen results can be secured only through such constant care in the manufacture of Simplex parts. Due to the tremendous enlargement of the picture from the film to the screen, unsteadiness becomes noticeable and objectionable, thus greatly reducing the entertainment value of the picture. Unsteadiness in some instances may be due to errors in photography, but frequently is the result of projectors which are poorly designed and constructed or in a defective condition. Failure to use properly made parts is a harmful practice.

Basic Mechanical Excellence

In addition to basic mechanical excellence, Simplex Projectors have many exclusive patented features which secure ease and safety in operation, and reduce maintenance cost. Supplementing the many other desirable features of Simplex Projectors is our wide sales and service organization throughout the United States and in many parts of the world. Our representatives are also able to help theatre owners and others using Simplex Projectors by solving their technical problems and by prompt, adequate service in supplying parts for emergencies. Service to be satisfactory involves willingness to help as well as adequate facilities and we assure users of Simplex Products that either direct or through our representatives we are glad at all times to be of assistance whenever it is in our power to do so. A cordial invitation is extended to visit our offices and inspect our factory. Packing, shipping and servicing of Simplex Projectors also involve many problems and here again our great experience and vast resources enable us to maintain our outstanding international leadership in this field.

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How The Ophthalm-O-Graph and Metron-O-Scope SOLVE YOUR READING PROBLEMS

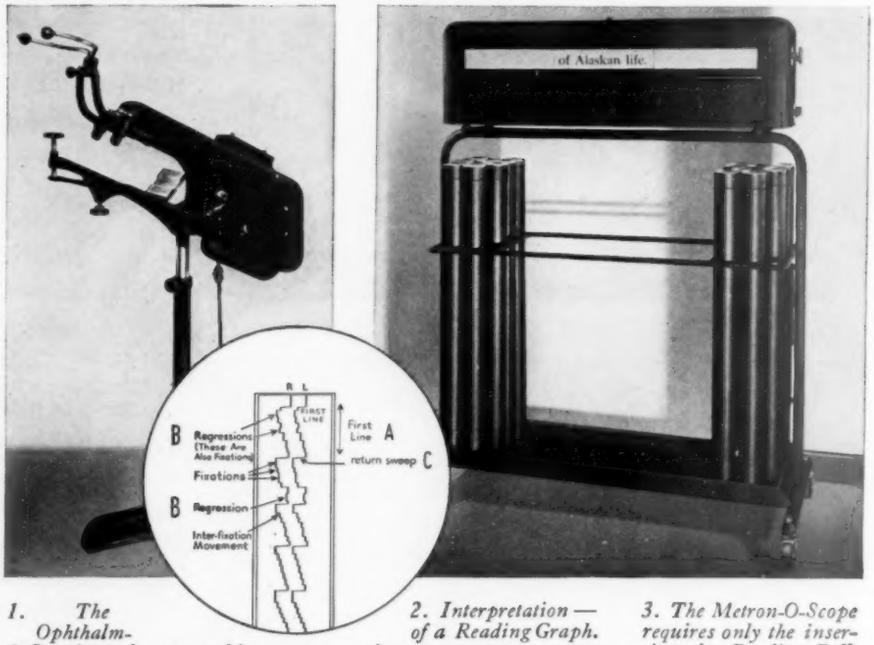
The Ophthalm-O-Graph and the Metron-O-Scope are two instruments now being used successfully in schools and leading universities both to determine just how well a student reads and to increase his reading efficiency as well. They offer you definite solution of your reading problems.

The Ophthalm-O-Graph provides positive information concerning reading habits. It is a portable eye movement camera which furnishes the teacher with actual photographs (graphs) of the student's eyes—taken while the eyes are at work. From these graphs the reading ability of the student in terms of speed, fixations, regressions, and span of recognition can be quickly determined. In this way the reading graph reflects the form and maturity of the reading habit.

For years teachers have been confronted with the problem of separating poor readers from good readers. The Ophthalm-O-Graph not only discloses which are the poor readers but actually shows reasons why.

The Metron-O-Scope provides the necessary means for bringing the child's reading efficiency up to normal or better. This instrument has three shutters in front which open and close in rhythmical sequence, each exposing a third of a line of words printed on a reading roll which unwinds like a player piano roll.

The student is encouraged to read correctly, for the operation of the instrument will not permit him to pause excessively long or to retrace his reading. In addition, the roll can be speeded up, teaching him by degrees to increase his reading speed. A wide variety of roll material suitable for all levels of instruction is available.



1. The Ophthalm-O-Graph can be operated by anyone after brief instruction. The cost of each test is only a few cents.

2. Interpretation — of a Reading Graph. A—eye movements across one line of print. B—regressions. C—return sweep.

3. The Metron-O-Scope requires only the insertion of a Reading Roll, and a flick of a switch.

Educators Endorse This Proved Reading Technique

The problem of reading failures has long been a source of study and research with educators. Many children have been regarded dull when the whole trouble lay in their inability to read correctly.

The Ophthalm-O-Graph and the Metron-O-Scope change all this. Eminent authorities on the prevention and correction of reading difficulties agree that these new instruments are the greatest single contribution to the teaching of reading.

American Optical Company will be glad to furnish you with complete information together with the names of the schools and universities in your vicinity using these instruments.

THE AMPRO CORPORATION

2839 N. Western Avenue
Chicago, Ill.

The illustration below is an actual photograph of 110 Ampro Projectors just prior to shipment to the public schools.

The Largest Single School Order EVER PLACED!

If you are considering the purchase of 16 mm projectors either silent or sound-on-film, study the following facts:

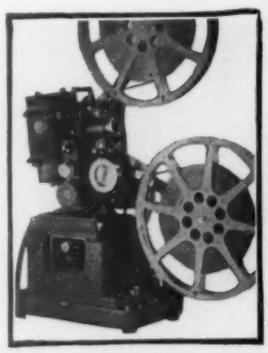
One hundred and ten Ampro 16 mm silent projectors at one time—that was the order recently placed by the Detroit Public Schools. To the best of our knowledge, this is the largest single order ever placed for 16 mm equipment by any public system in this country. The previous year **eighty-three** Ampro Projectors had been purchased by the Detroit Board of Education. The performance of these machines under actual classroom and school auditorium conditions resulted in this year's record-breaking order.

Today, Ampro sound-on-film and silent projectors are standard equipment in the schools of Chicago, Kansas City, New York, Pittsburgh, Atlanta, Boston, Los Angeles, Brooklyn, San Francisco—in scores of other cities, in U. S. Government Departments, in thousands of universities, churches, museums and homes all over the world.

Clear, brilliant illumination, ease of operation, sturdy precision construction, and numerous special features explain the steady forward "march of Ampro." For the complete story of Ampro sound-on-film, silent and convertible projectors, together with full list of prices, send coupon below.

16 mm Sound-on-Film

Ampro 16 mm Sound-on-Film Projectors have brought actual new standards of tone quality, illumination, simplicity of operation to the field of 16 mm Sound-on-Film. There are numerous features of design and construction that explain this. Surprisingly low priced. Get the full story of Ampro sound before making any decision.



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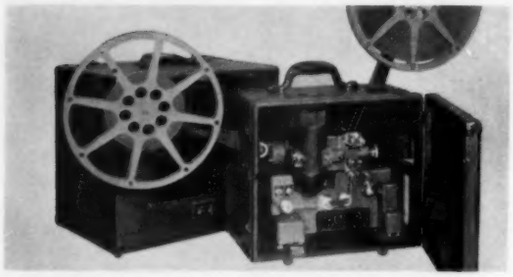
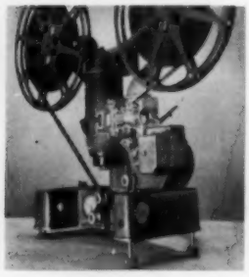
Educational, Professional, and Personal Motion Picture Equipment



New Filmosound 138

An ideal sound-on-film reproducer for the majority of schools. Made as a single-case outfit or two-case, as shown, with blimp for silencing the mechanism. New features include single-frame projection and reverse projection devices. Has 750-watt lamp, hum-free exciter lamp, speaker-hiss eliminator, and 1600-foot film capacity for 45-minute sound programs or hour-long silent programs

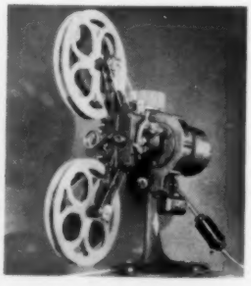


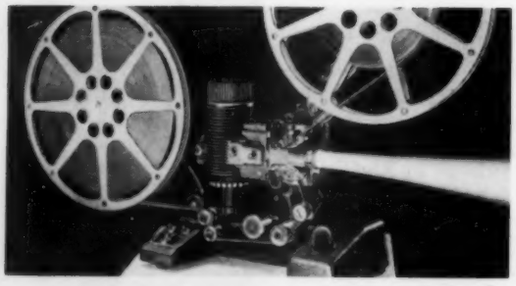
Filmosound 130

***Left* — For use where audiences may run to 2500, the Filmosound 130 is the choice. Brilliant pictures are assured by the new B & H 1000-watt lamp, which incorporates a carbon-collecting plate that arrests blackening and prolongs the lamp's useful life. Capacity, 1600 feet of 16 mm. film**

Filmo Model "S"

***Right* — A low-priced 16 mm. silent projector which reproduces with theater quality in classroom or moderate-sized auditorium. Supplied with either 750- or 500-watt lamp, it meets a wide range of requirements. Film capacity, 400 feet**





THE AMERICAN SCHOOL AND UNIVERSITY

● Tests show that students learn from 20% to 90% more, learn in shorter time, and forget less when motion pictures are used. But in securing maximum results from this modern aid in teaching, much depends on the projector. It must be capable of professional-quality presentations in amateur hands and under adverse conditions.

Bell & Howell projectors produce brilliant pictures even where facilities for darkening the room are inadequate. Brilliance is uniform over the entire screen; important details appearing at corners and edges of the screen are sharp and clear. Pictures are rock-steady, free from jump and flicker; young eyes are protected, and the dullness induced by fatigue is avoided.

Bell & Howell projectors are simple; no "gadgets" requiring expert nicety of adjustment. Easy accessibility and plain labeling of all controls further assure perfect presentations by inexperienced operators. Oiling, cleaning, replacing lamps, and other normal maintenance operations are equally simple, assuring minimum upkeep and high efficiency throughout a long life.

A Bell & Howell Projector cannot damage film. Scratching is made impossible by precision workmanship. Film travels in a straight line without twists, and the shuttle teeth move straight in, down, and straight out—no sawing on perforations.

All Bell & Howell projectors incorporate the precision workmanship and engineering developments which have made Bell & Howell the preferred equipment in the world's leading film-producing studios and film laboratories for thirty years. The slight additional first cost is far outweighed by the many added years of serviceable life—the only true measure of cost on an investment such as a projector.

Purchase is made easy for any school by the B & H Rental-Purchase and Time Payment Plans. Write for complete information on B & H Projectors, purchase plans, and B & H Film Library.

Filmo 129

***Left*—Silent projector for moderate-sized auditoriums as well as classrooms. 750-watt illumination. Capacity, 1600 feet of 16 mm. film for hour-long uninterrupted programs**

HERMAN A. DEVRY INC.

New York Chicago Hollywood

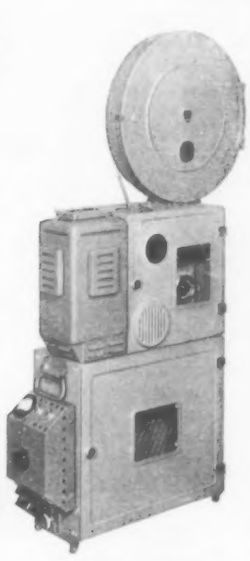
Manufacturer of the Largest Line of Motion Picture-Sound Equipment in the World

GENERAL OFFICES AND MAIN PLANT: 1111 ARMITAGE AVENUE, CHICAGO PLANT NO. 2 2535 N. Ashland Ave.

D VRY 35 mm. SOUND PROJECTORS

DeLuxe Solid Base Theatre Projector

Designed for Sound from the Ground up! Streamlined — Dust Proof—Fewer Parts—Lower Costs —Either Low or High Intensity Arcs, or Mazda illumination. New DeVry "Brillante" Lens



The Semi-Portable

Accommodates 2000 ft. Reels. Full Theatre Mechanism identical with solid base theatre projector. 1000 Watt Mazda Lamp. Can be set on table or stand. DeVry "Brillante" Lens

The Portable with 2000 Ft. Magazine

Identical with the famous DeVry "ESF" Portable—except larger case and magazine to accommodate the 2000 ft. reel

Write Dept. N for free circulars on any items shown on this page

* * * *

Also

DeVry "G" 16 mm. silent projector for home and classroom

DeVry "A" Silent 35 mm. Newsreel Camera

DeVry "No. 60" 16 mm. Camera

DeVry School Films

BOOKLETS

1. Values of Movies and Talkies in Education
2. Glorify Your Product (Films for Business)
3. Bangs No - Home - Work Plan

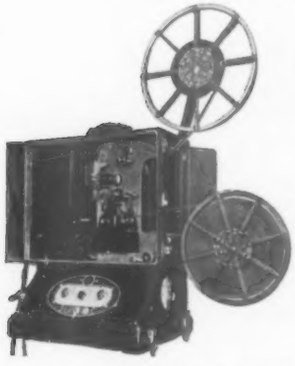
MAGAZINE

DeVry Movie News

ANNUAL CONFERENCE

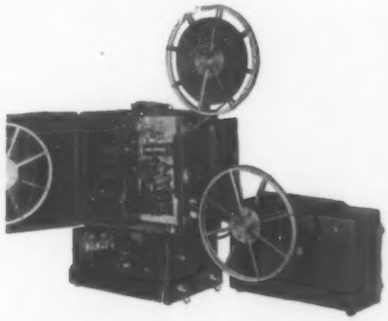
National Conference on Visual Education—June 20-23, 1938

DeVRY 16 mm. SOUND PROJECTORS



DeVry 16 mm. Sprocket Intermittent Sound Projector

The Sprocket Intermittent. **Greatest advance in 16 mm. projection in a decade. Incorporates the *rotary* sprocket intermittent used in all the theatre machines, instead of the *claw* movement used in all other 16 mm. projectors. Also—exclusive—Double Exciter Lamps. Amplifier in separate case for Public Address, 750 to 1000 Watt lamp. Many other superior innovations**

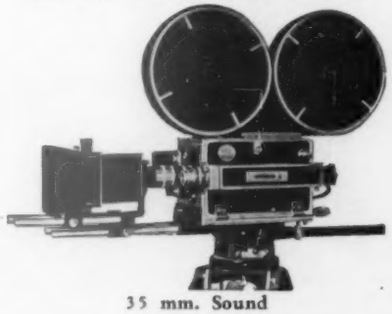


DeVry 16 mm. *Challenger* Sound Projector

The claw (multiple) movement at its best. Lower in cost, it incorporates many of the exclusive features of the *Sprocket Intermittent Projector*

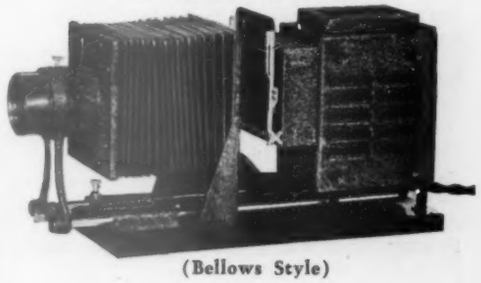
All DeVry Sound Projectors run **Silent Films,** as well as **Sound.** The Projector in the Sound unit may be purchased first for running silent films; the sound element can be added later. All DeVry Sound Units may be used for Public Address

DeVRY SOUND CAMERA



35 mm. Sound
16 mm. Sound

THE DeVRY DAYLIGHT STEREOPTICON

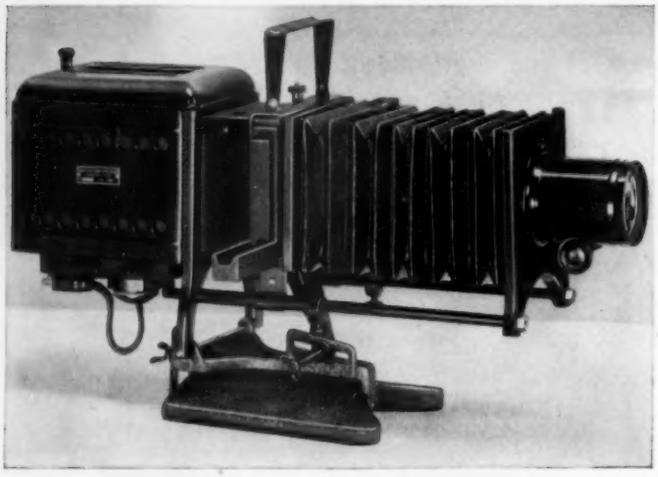


(Bellows Style)

BAUSCH & LOMB OPTICAL COMPANY

655 St. Paul Street, Rochester, N. Y.

New York Chicago Boston Los Angeles San Francisco
London, England Frankfurt A/M, Germany



BDT BALOPTICON—For Slides Only

This extremely popular model is inexpensive, sturdy in construction, compact, easily portable and highly efficient. Its optical system is of exceptionally high quality and (depending on the lamp and lens used) can be used at distances from 4 to 80 feet from the screen. Image sizes range up to as large as 10 feet on the longer side. Maximum illumination. Extremely simple to operate. Still film, micro-projector and overhead projector attachments are available. The sturdy, tilting base is adjustable in two meridians and permits leveling the Balopticon even when placed on an uneven surface. This mounting allows for changing the projection angle for screen at various heights.

Model B is the same instrument as the BDT but without the tilting base. It is recommended for use where a permanent installation is being made, although it is readily portable.

ERM BALOPTICON —For Opaque Objects

Model ERM Balopticon is used to project opaque objects only. For that reason, economy is one of the major advantages of this projector. Photographs, pages or pictures from books, charts, drawings, actual objects such as botanical specimens are all excellent materials for this projector. Projects a 6″ square area of object but pages, charts, etc., up to 14″ can be accommodated. Specially designed parabolic reflector produces an unusually bright shadow-free image from a 500 watt lamp. Excels any projector with similar light source offered today.

Model LRM is arranged to project both opaque objects and lantern slides. This instrument allows you material available for both types of projection.

SEND FOR CATALOGS

Catalog E-11, "Balopticons and Accessories," completely describes our line of Balopticons, many of which were omitted here due to lack of space. Micro-Projectors for school and college use are the subjects for Catalog E-20. For information on Bausch & Lomb Microscopes and Spectrographs see page 560 of this book.

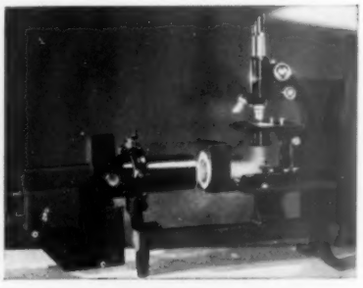
KOSB BALOPTICON —For Translucent Screen Projection

This projector is placed behind a translucent screen and the image is seen on the other side. It is especially designed for class room work for the teacher faces the class, standing by the screen and lecturing on the subject matter illustrated. So simple to operate that the teacher does not require an assistant. So powerful is the illumination that room can be left light enough for note taking. Projects opaque material up to 6″ x 6″ or a 6″ square section of a larger object. Projects standard size lantern slides. Strip film attachment available. Blower keeps interior of projector cool at all times. Easily portable.

OVERHEAD PROJECTOR ATTACHMENT —(For Use with Models B and BDT and KOSB)

This ingenious accessory permits the teacher to operate his own Balopticon and face his class. The image is thrown on a screen back of and over the head of the teacher. Teacher can point to objects on slide with pencil—image of pointer appears on the screen. A most efficient teaching aid and a great time-saver.

MODEL B MICRO-PROJECTOR



Now Bausch & Lomb offers a new Micro-Projector at a new low price. Any standard compound microscope can be used.

Simply place the microscope on the stage of the projector in an upright position, apply the prism reflector cap to the microscope and focus the illuminator. Complete directions accompany each projector.

Investigate this new instrument before completing your plans for science laboratory development.

TRIPLE-PURPOSE MICRO-PROJECTOR

Especially designed and priced for high schools, this extremely efficient unit serves three definite purposes—(1) projection of permanently mounted specimens on a screen from 4 to 15 feet away. (2) making drawings of microscopic fields. (3) projection of living specimens in liquids. Exceptionally sturdy in construction. Has both coarse and fine focusing adjustment. A two-power projection lens is included.

BALOPTICON TABLE

The B & L Balopticon Table provides a means of placing a Balopticon where it can be used to best advantage. It is portable (rollers on two front legs), and has a shelf underneath for slide boxes.

SPENCER LENS COMPANY

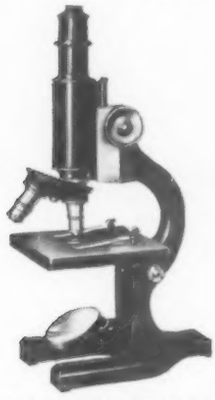
Buffalo, New York

Manufacturers of

Microscopes—Microtomes—Optical Measuring Instruments
Delineascopes—Photomicrographic Cameras

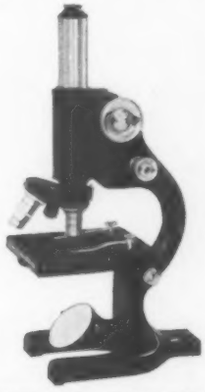
BRANCH OFFICES

New York . . . Chicago . . . Washington . . . Boston . . . San Francisco . . . Los Angeles . . . Dallas . . . Columbus



STUDENT MICROSCOPE No. 74

A low cost, standard size, quality instrument for classroom work requiring magnifications up to 360 diameters. Equipped with coarse adjustment only. Solid bakelite stage, 110 mm. x 105 mm., will not warp and is resistant to all ordinary laboratory reagents. Revolving disc diaphragm is easily rotated at edge of stage. Concave, adjustable mirror of standard diameter, is mounted in an adjustable fork. Substage condenser cannot be supplied with this instrument.

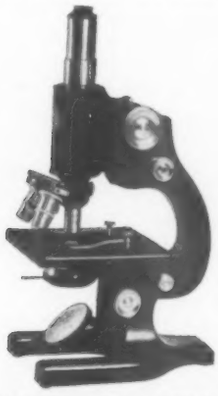


ELEMENTARY LABORATORY MICROSCOPE No. 66

This standard size microscope for biological laboratory work has the same high quality optics and mechanical parts found on the more expensive instruments. Equipped with coarse and fine adjustment. Substage condenser cannot be supplied with this instrument. Durable, bakelite stage 110 mm. x 105 mm. Sturdy, revolving disc type diaphragm under the stage is easily manipulated at edge of stage.

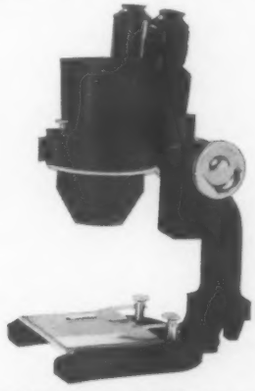
ROUTINE LABORATORY MICROSCOPE No. 63

This microscope meets the most rigid specifications for a sturdy, durable and precision laboratory instrument. Designed to accommodate a substage condenser for greater magnifications. Highest quality optical system. Has both coarse and fine adjustment. Durable bakelite stage 125 mm. square. An iris diaphragm, located under the stage, insures satisfactory modification of illumination for low power work.



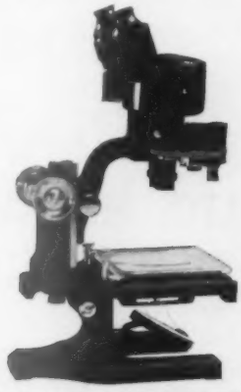
ADVANCED LABORATORY MICROSCOPE No. 33H

Designed for almost any type of microscopic observation because it permits the use of all standard Spencer microscope accessories. Has the following exclusive Spencer optical and mechanical features: (1) Balanced Optical System, (2) Dual-Cone Nosepiece, (3) Fork-Type rack and pinion Substage, (4) Rhodium Plated Parts. Has micrometer type fine adjustment. It is the microscope generally selected for medical work. Mechanical stage on No. 33MH has a range sufficient to cover 3″ x 2″ microscope slide.



JUNIOR BINOCULAR MICROSCOPE No. 57A

This instrument meets the demand for a low cost, low power binocular microscope for general classroom use. The stereoscopic and erected image aids inspection and analysis of the object. The paired objectives are of the same optical quality as those used on higher priced instruments and may be furnished in a special, dustproof revolving nosepiece. Supplied at slightly higher cost with base, mirror and inclination joint.



STANDARD BINOCULAR MICROSCOPE No. 55

For most exacting laboratory and classroom work this large and sturdy low power binocular microscope provides for magnifications from 3.6 to 210. Has a large 100 mm. square stage. Accommodates large dishes and specimens. The 16° convergence of the objectives increases the depth of focus. Number 56 is identical to number 55 except that it is not equipped with the base, mirror and inclination joint shown in the illustration. Both instruments are available with vertical or inclined binocular bodies.

THERE IS A SPENCER MICROSCOPE FOR EVERY PURPOSE. WRITE DEPT. 13A FOR COMPLETE DETAILS

SEE PAGE 561
FOR DELINEASCOPES

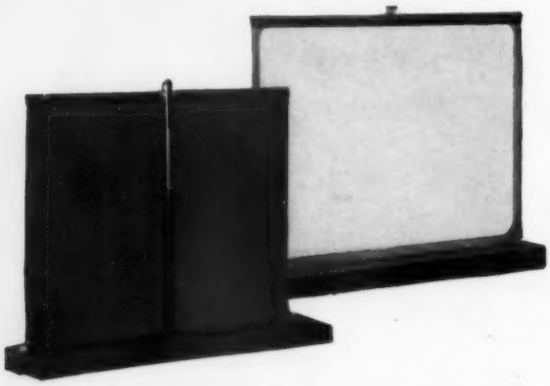
DA-LITE SCREEN CO., INC.

2723 No. Crawford Ave., Chicago, Illinois

The World's Most Complete Line of Projection Screens

SCREENS FAMOUS for QUALITY

Da-Lite Screens, for theatrical and non-professional use, have been famous for their efficiency and the high quality of their material and workmanship for more than a quarter of a century. The Da-Lite line includes white, silver and glass-beaded screens in the world's most complete assortment of sizes and types of mountings, a few of which are illustrated here.



DA-LITE TABLE MODELS

Several popular styles are available for use on desk or table. The New Deal (shown above) is the outstanding leader in the medium priced field. Its exclusive Da-Lite collapsible support locks automatically in place when it is extended to the proper height. The screen, when hooked over the gooseneck of this support, is held in perfect alignment assuring perfect focus of the entire picture. Surface is glass-beaded unless otherwise specified. Ten sizes, 22″ x 30″ to 72″ x 96″ inclusive.

DA-LITE HANGING SCREENS

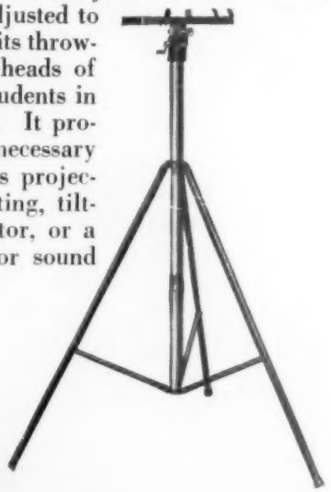
In science laboratories and auditoriums where permanent installations are advisable, Da-Lite Hanging Screens are recommended. They are available in a wide variety of styles for hanging from walls, ceilings, or special tripods. All have the famous Da-Lite glass-beaded surface unless otherwise specified. Twenty different sizes from 22″ x 30″ to 12′ x 12′ assure a right screen for every requirement. Your dealer will gladly demonstrate. Write for latest catalog.

THE DA-LITE CHALLENGER

The most popular portable screen on the market. A tripod pivotally attached to the case permits quick set-up anywhere. Adjustable to height desired. No thumb screws. Top of largest size can be raised 9′ 10″ from floor. Unless otherwise specified, the surface is glass-beaded, assuring brightest, clearest pictures. Seven sizes, 30″ x 40″ to 70″ x 94″ inclusive.

THE DA-LITE PROJECTOR STAND

Classes start promptly when the projection equipment includes a convenient Da-Lite Projector Stand. It can be set up anywhere and adjusted to the height desired. It permits throwing the picture above the heads of the audience and seating students in direct line with the screen. It provides a *steady* support so necessary for vibrationless, flickerless projection. Equipped with rotating, tilting table for silent projector, or a special non-tilting table for sound and slide projectors.



Look for this Trade Mark!

DA-LITE

Reg. U. S. Pat. Off

It is your assurance of highest quality, perfect projection and long economical service. Catalog on request. Write today!

GENERAL ELECTRIC COMPANY

1 River Road, Schenectady, New York

MOTION PICTURES

General Electric motion pictures are loaned to educational institutions, churches, social, civic and business clubs in the interest of educational commercial development and public welfare. Write for Bulletin GES-402-E which contains a brief description of the subjects listed, the nearest point from which the exhibitor may procure films, and other general information.

CLASSIFIED INDEX OF SUBJECTS

TRANSPORTATION

The Electric Ship
Conquest of the Cascades
The Broken Barrier
The Trolley Coach in Operation
The Zephyr
Trolley Coach Popularity
Trackless Electric Transportation
King of the Rails
Queen of the Waves
The Panama Canal
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Diesel Electric Switchers
Moving the Millions Electrically

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When You Can Measure

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The Sugar Trail
A Woolen Yarn
Conquest of the Forest
The Conductor
Our Daily Bread
Wizardry of Wireless
The World of Paper
Anthracite
Bituminous
Pillars of Salt

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Light for Living
The Light of a Race
Mazda Lamp Manufacturing
The Cat and the Kit

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Ties of Steel
Automatic Arc Welding
Welding Battered Rail Ends
Arc Welding in Business Erection

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Mica Insulation by Machine Methods
Life of Thomas A. Edison
Service to Agriculture
General Electric at the World's Fair
Just Around the Corner
The Benefactor
Thomas A. Edison
The Yoke of the Past
From Now On
The Molder
Something New Under the Sun
Three Women
Bill Howard, R. F. D.

ERPI PICTURE CONSULTANTS

INCORPORATED

250 West 57th Street, New York, N. Y.

All motion pictures are educational if education is thought of as life experience. However, distinctions exist between films prepared for entertainment purposes, those assembled for novelty or survey presentation, and the **teaching film** produced specifically for classroom use.

No one will deny the educational value of selected feature pictures when shown in the theatre or school auditorium. Certainly travelogues, news reels, documentary subjects, novelties and the like, possess general, and in many cases great, educational value and may be used to vitalize auditorium assemblies or provide material for noon hour recreation and club activities.

However, the properly prepared **teaching film** is produced as an integral part of a unit of instruction that has a definite relation to a course of study being taught by the individual teacher. It emphasizes the salient features of a specific body of subject matter and is employed by the skillful teacher for a particular or combination of purposes—

(1) to stimulate interest in the introduction of a new unit of instruction,
(2) as a direct teaching aid in presenting major concepts of a unit which is otherwise difficult or often impossible to present,
(3) to enrich or extend the content of a unit,
(4) to summarize or review a unit's work.

Obviously, such a film should be utilized quite differently, and more frequently, than "just a motion picture" if optimum benefits are to accrue.

BIOLOGICAL SCIENCE

Plant Life

1. Plant Growth—Entire story of the pea plant from germinating seed to scattering ripening seed. Pollination and fertilization by natural and time-lapse photography and animation.

2. Roots of Plants—Various forms, structure and growth, time-lapse and microphotography. Functions of root-cap and root-hair, with relation of osmosis to water absorption by roots.

3. Leaves — Various types, and relationship of leaves to other parts of plant. Processes depicted by animation and microscopic cross-section of leaves; photosynthesis; modified leaf forms.

4. Flowers at Work—Physiology of flowers by time-lapse and microphotography. Methods of pollination, cross - fertilization, modification by cultivation.

5. Seed Dispersal—Methods of seed scattering; by wind, animals, forceful propulsion from seed case. Stop-motion photography of escape from seed case and struggle for survival.

6. Fungus Plants — Mushrooms, molds, and other fungi. Economic importance as food, destroyers of dead organic matter, and causes of disease.

7. The Dodder—Life story of a parasitic flowering plant. Its growth and effect on host plants shown by animation and stop-motion photography.

8. Plant Traps—The pitcher plant and sundew shown through their life cycles. Time-elapse photography of carnivorous activities.

Animal Life

1. The Frog—Life cycle of a representative amphibian from embryo to adult. Slow-motion, stop-motion, and microscopic photography.

2. How Nature Protects Animals—Examples of natural protection through fleetness of foot, mimicry, protective coloration, armor, and secluded homes, through insect and mammalian examples.

3. Beach and Sea Animals—Physical structure and activities of starfish, sea-urchin, crab, octopus, scallop and sea cucumber. Illustrations of balance in nature.

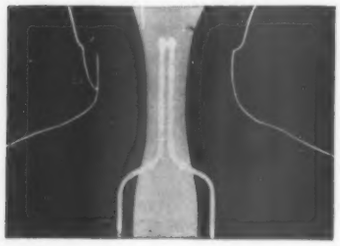
4. Tiny Water Animals—Life processes and activities of amoebae and paramecia, including reproduction; microphotography of other interesting animalcules.

5. Butterflies—Life history and nature's control of cabbage butterfly; swallow-tail butterfly, their role in cross-fertilization of flowers.

6. Moths — Life histories of silk moth and white masked tussock moth. Cocoon construction, economic importance.

7. Beetles—The ladybird beetle, the tiger beetle, and the Japanese beetle; their life history and economic relation to man.

8. Pond Insects—Interesting episodes from the life cycles of the diving water beetle, the dragonfly, and the mayfly.



9. Aphids — Their life cycle, unusual parentage, domestication by ants, and economic importance.

10. The Housefly —Complete story of this common but extremely dangerous pest; its activities as a carrier of disease, and methods of control.

11. Spiders—Complete life cycle of nursery-web, orb-web, funnel-web, and trap-door spiders. Interesting story of peculiar habits.

12. Birds of Prey—Various vultures, hawks, the bald eagle, and various owls in natural habitats; characteristic activities and sounds.

13. Animal Life—Main type of animals and animal functions from sponges to mammals. Locomotion, food intake, digestion, respiration, and nervous activity.

14. Reactions in Plants and Animals—Study of stimulus and reaction in different types of plants and animals. Tropisms and higher reactions.

Human Biology

1. Mechanisms of Breathing—Operation and control of the breathing mechanisms, including pathological conditions. Factors affecting rate and depth of breathing.

2. The Heart and Circulation—Mechanics of the pulmonary and systemic systems. Heart action with sounds. Capillary action; blood pressure.

3. Body Defenses Against Disease—Microscopic examination of the three lines of defense—skin, lymphatics, and the blood. Phagocytosis and antibodies.

4. The Nervous System—Depiction of the nervous system; nerve impulses and their pathways and connections. Nature of nerve impulses.

5. Reproduction Among Mammals—The story of embryology illustrated in the domestic pig. Fertilization, cleavage, blastulation, and subsequent developments ending with birth.

PHYSICAL SCIENCE

Astronomy

1. The Earth in Motion—The dynamic aspects of the earth as a planet. Proof of sphericity, rotation, and revolution.

2. The Solar Family—The real and apparent motion of the planets. Motion of the solar system in space..

3. The Moon—The tides and phases of the moon. The moon's orbit, the lunar month, lunar and solar eclipses, the moon's path in space.

4. Exploring the Universe — The dynamic aspects of the stars within our galaxy and of the galaxies themselves. Apparent star motion, galactic rotation.

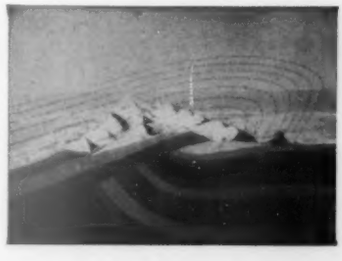
Geology

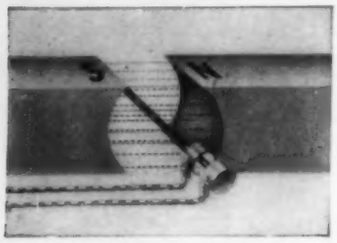
1. The Work of Rivers—The erosion cycle of water on the earth's surface. Falls, deltas, meanders, lakes, rejuvenation.

2. Ground Water—Artesian wells, springs, water tables, caves and wells. Geysers, petrification and concentration.

3. The Work of the Atmosphere—Temperature variations and erosion. The work of the wind in moving sand, loess, dust; formation of soil.

4. Geological Work of Ice—Types of glaciers and topographical results of glacial activities; the great ice ages; other gradational work of ice.





5. Mountain Building—The story of mountain building and land subsidence; significance of these phenomena to mining and structural engineering.

6. Volcanoes in Action—Causes and distribution of volcanoes throughout the world. Present and past volcanic action; dykes, sills, and other products of volcanism.

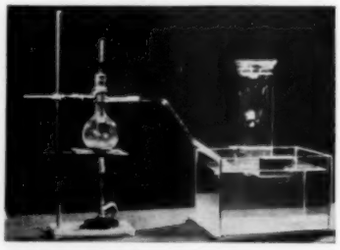
7. The Earth's Rocky Crust—Introduction to elementary geology; new land formation through volcanism and gradation.

8. The Wearing Away of the Land—How the land is affected by chemical decomposition of rocks, glaciers, wind and waves. Upbuilding of land.

9. The Work of Running Water—Many picturesque results of erosion. Stream deposits, deltas, and flood plains.

Physics

1. Energy and Its Transformations—Potential, kinetic and radiant energy as manifested in mechanical, chemical, and thermal forms. Concepts of "power" and "work."



2. Electrostatics — Relation of static electricity to modern theories of electricity; electrification; electroscope, and Compton electrometer.

3. Electrodynamics—Fundamental processes of current electricity and electromagnetism. Historical experiments, magnetic hypothesis, generators, induction, transformers.

4. Electrons — Development of the hypothesis that electricity consists of unit elementary changes, by observation of phenomena of conduction.

5. Sound Waves and Their Sources—Characteristics of sound waves such as frequency, amplitude, wave length, fundamentals, and harmonics.

6. Fundamentals of Acoustics—Phenomena of hearing and modification of sound between source and hearer. Velocity, refraction, attenuation, reverberation, and focusing.

7. Light Waves and Their Uses — Processes of reflection and refraction. Interference and polarization, electromagnetic spectrum and quantrum theory.

Chemistry

1. Oxidation and Reduction—These phenomena as simultaneous processes shown by experiments with phosphorus, iron, and mercury. Everyday examples.

2. Molecular Theory of Matter—Evidence of molecular activity in gases, liquids, and solids is presented in support of the molecular theory of matter; difficult experiments demonstrated.

3. Electrochemistry — Electrolytic decomposition of hydrogen chloride, electric current from action of chlorine and hydrogen on platinum. The storage battery; electroplating; electrorefining, and electrolysis.

4. Colloids—Portrayal of colloidal suspensions: liquid in gas, gas in liquid, solid in liquid, solid in gas, and liquid in liquid. Brownian movement, Cottrell process of smoke precipitation.

5. Velocity of Chemical Reactions—The rate of chemical reactions affected by nature of reacting substances by their concentration and by temperature. Reversible reactions and chemical equilibrium.

6. Catalysis — Adsorption, intermediate compounds, chain reactions, breaking of reaction chains, poisoning of catalysts, and negative catalysts or inhibitors.

HUMAN GEOGRAPHY

1. Shelter—Effect of climate and availability of materials on shelter. How man has learned to change raw materials to adapt them to the construction of various types of shelter.

2. Animals in Modern Life—Uses to which animals are put in our modern civilization: to furnish food, clothing material, and power. Picturesque world scenes.

3. Our Earth—A survey of its physical aspects in relation to activities of peoples. Oceans, harbors, rivers and lakes, valleys, plateaus and mountains.

4. Water Power—Development of water power from the small colonial mill to Niagara, Boulder Dam, and the Tennessee Valley. A world-wide survey of potential water power.

5. The Development of Transportation—Transportation developments within the United States during the past one hundred fifty years, in overcoming physical barriers.

6. Clothing—Typical sources of clothing among backward peoples. Mass production and its effect on world clothing habits.

7. A Backward Civilization: The Berbers of North Africa—Survey of the life among the Berbers; an isolated type of civilization. Handicrafts, agriculture, customs and superstitions.

8. Conservation of Natural Resources—Water power, forests, and farm lands. Wastes in lumbering and agriculture. Wind and water erosion and unwise farming; local and federal efforts to check these abuses.

MUSIC

1. The Percussion Group—Studies of the appearance, tone quality, and techniques of playing of the percussion instruments. Relation of percussions to symphony performance.

2. The Symphony Orchestra—The work of the conductor admirably caught by unique camera angles as he interprets brilliant scores through his orchestra of Philharmonic players.

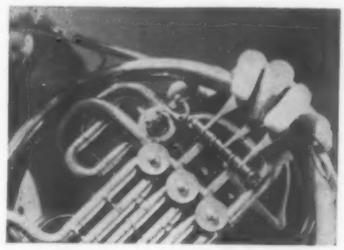
3. The String Choir—Functions of the stringed instruments in orchestral music. Bowing and pizzicato; finger techniques. Each instrument demonstrated in orchestral setting.

4. The Woodwind Choir—Displaying the woodwind instruments. Demonstrates individual tone qualities and gives pupils opportunity for studying playing techniques. Function of woodwinds in orchestra music.

5. The Brass Choir—Study of playing techniques among members of the brass choir and its contribution to symphony music. Demonstrations in full orchestral setting.

PRIMARY GRADE SERIES

1. Animals of the Zoo—A study not only of the animals themselves, but the different kinds of food they eat, mainly in the conditions of their native homes.



2. Adventures of Bunny Rabbit—Characteristics and habits of rabbits in their natural environments in a dramatic, informational film. Bunny's adventures with various farm animals.

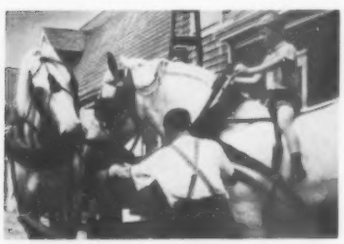
3. Farm Animals—Care and activities of farm animals; natural sounds. Feeding and milking, typical activities of farm animals, old and young.

4. Poultry on the Farm—The appearance and habits of adult and young chickens, ducks, geese and turkeys, in natural farm setting. Authentic sound.

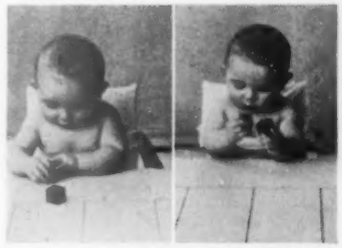
CHILD PSYCHOLOGY

1. The Growth of Infant Behavior: Later Stages—Increasing ability of the growing infant to use his hands. Definite and predictable stages. Growth of the prenatal hand.

2. Posture and Locomotion—Steps by which the infant advances from a helpless state to the stage where he is able to change position and posture at will by various methods.



3. From Creeping to Walking — Mechanics of locomotion and stages by which the infant gradually attains a walking upright posture. The correlation of abilities is illustrated.



4. The Study of Infant Behavior—Clinical and research activities of the Yale Clinic of Child Development. Systematic photographic records of the reactions of infants.

5. The Growth of Infant Behavior: Early Stages—Rapid growth of behavior patterns in early infancy. Reactions of the self-same infant at different ages in comparison.

6. Behavior Patterns at One Year—Behavior patterns of a normal infant fifty-two weeks of age. The baby's reactions to cubes; other test situations.

7. Learning and Growth—Principles which govern the learning process. The possibilities and limitations of training infants from twenty-four to forty-eight weeks of age.

8. Early Social Behavior—Manifestations of infant personality. Ten different children from eight weeks to seven years of age are depicted; individual differences.

9. A Baby's Day at Twelve Weeks—His domestic day, from the time of waking at six o'clock in the morning until ten o'clock at night.

10. A Thirty-six Weeks' Behavior Day—Boy whose behavior day at 12 weeks was charted has made striking progress. His reactions are compared with those at twenty-four weeks.

11. A Behavior Day at Forty-Eight Weeks—Child care, including the bath, dressing, feeding, elimination, floor play and daytime naps and sleep.

12. Stages of Child Growth — Dr. Buhler demonstrates tests for measuring sensory acuity, reactions to social stimuli and powers of imitation in children of pre-school age.

13. A Few Tests of Child Intelligence—Techniques employed by good psychologists. It is of interest and value to both parents and educators.

VOCATIONAL GUIDANCE

1. The Builders—A cross section of the building trades, centered around the construction of a huge skyscraper; shows specialized artisans at work.

2. Choosing Your Vocation—Dr. Kitson, as psychoanalyst, interpreting vocational problems of a high school boy.

. . .

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(To make a desk) ←——————————→ (To make a chair)

A FEW DESKOR LOCATIONS

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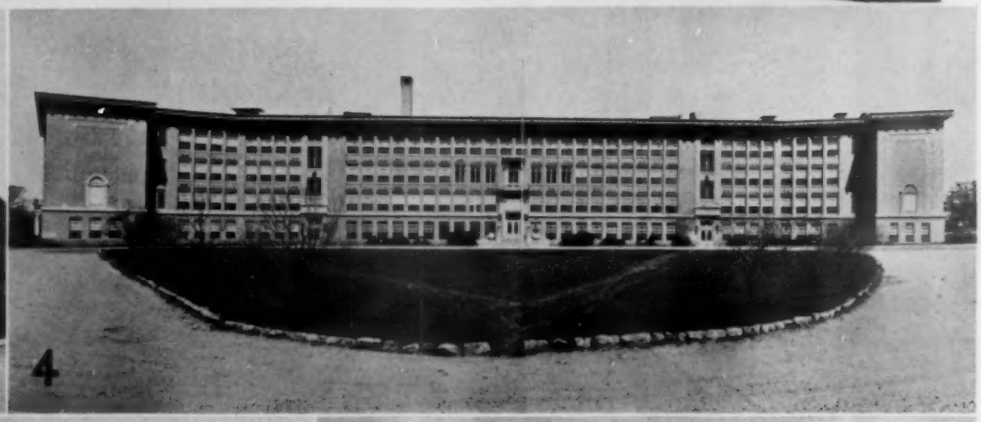
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8

1—Eastman Elementary School, East Concord, New Hampshire
Architect—Harold Holmes Owen, Concord, N. H.

2—Columbia Valley Garden School, Longview, Washington
Architect—George MacPherson

3—Mary J. Cowley School, Pittsburgh, Pennsylvania

4—North Quincy High School, North Quincy, Massachusetts
Architects—Frank Irving Cooper Corporation, Boston, Mass.

5—Jeremiah E. Burke High School for Girls, Boston, Massachusetts
Architect—George E. Robinson, Boston, Mass.

6—Dorchester High School for Girls, Boston, Massachusetts
Architects—Hartwell, Richardson & Driver, Boston

7—Fitchburg High School, Fitchburg, Massachusetts
Architects—Coolidge, Shepley, Bulfinch & Abbott

8—Russell School, District No. 3, Garden City, Kansas
Architect—Howard Blanchard, Garden City

Introduction

DESKOR

Space Saving School Furniture

The enriched educational program of the modern school requires an extensive physical plant with an increasing burden on tax resources, first, in original construction costs, and second, in the continuing costs of maintaining the larger building with its specialized facilities.

Often the problem presented to school executives is how to provide the facilities essential to an adequate educational program within the limits of a definitely restricted appropriation. In dealing with this problem, the primary fact to be kept in mind is that **space costs money.**

The first cost of any building is directly proportional to its cubage. Furthermore, throughout its life cubage influences the maintenance costs of every building, the amount of fuel required to heat it, the cost of repairs, the cost of custodial services.

The problem, then, becomes one of the efficient use of space. School executives are studying prospective classroom schedules to determine any rooms or special facilities which might be under-used. The educational building must be so planned as to provide for the maximum use of every room without sacrifice of present educational standards and with sufficient flexibility to be adaptable to future change.

To help meet this requirement, DESKOR, the convertible classroom-auditorium unit, was developed. In all sections of the country DESKOR is providing increased pupil capacity in a given area with a decrease in per pupil costs for both construction and maintenance. Savings in building costs frequently **exceed 25%.** Yet DESKOR actually increases the flexibility of the school building and it involves no sacrifice of educational standards. (DESKOR in combination with folding walls provides even greater flexibility and savings.)

DESKOR saves space by providing for the instant convertibility of classroom into study hall, auditorium or assembly, and vice versa.

DESKOR CHAIR SALES CORPORATION

Winthrop Building **BOSTON**

HOW DESKOR WORKS

A DESKOR unit consists of two separate parts as illustrated, a stationary chair and a removable converter. The converter provides the flexibility which enables DESKOR to function as a classroom or study hall chair-desk unit or as auditorium seating. When it is placed in the runways at the back of the stationary chair, it functions as a desk. When it is placed between two stationary chairs, it becomes an extra seat.

INSTANTLY CONVERTIBLE

Pupils make the change from one use to the other in four simple steps that require less than one minute.

ADAPTABLE TO ANY SIZE OF ROOM

A classroom can be converted instantly into assembly formation seating twice as many pupils. A music room can be converted instantly to seat twice as many for chorus work. A cafeteria can be converted instantly into an assembly room or study hall. An auditorium can be converted instantly into a study hall, and also be used for home stations. A study hall can be converted instantly into an auditorium seating twice as many. Two or more rooms can be thrown into one by means of folding partitions, thus providing an auditorium.

PRACTICAL, FLEXIBLE, STURDY, COMFORTABLE

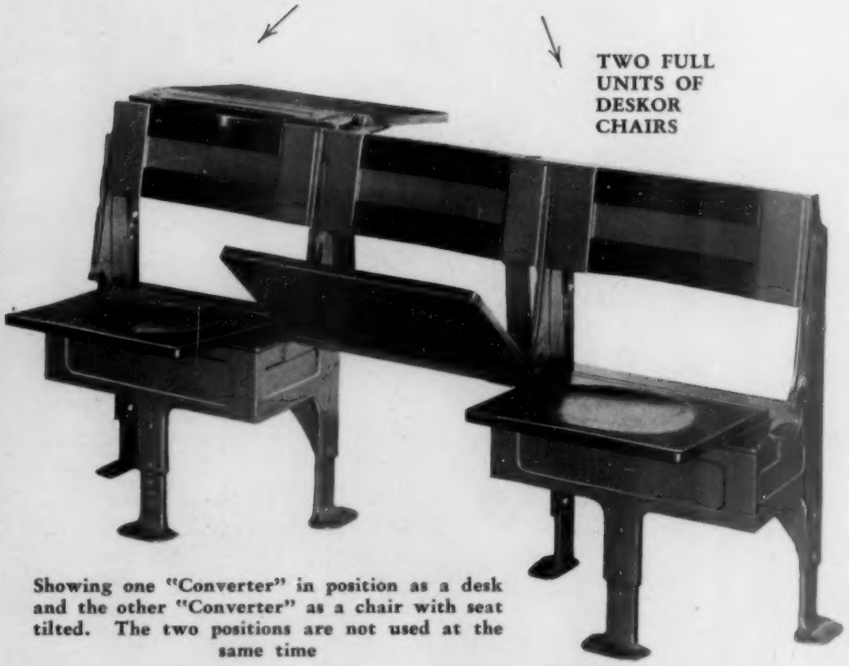
Every seat can be tilted to permit ease of entrance and exit. Height adjustment of chairs and desks is not affected by changing from one use to another. Nothing is brought into the room, nothing is taken from the room, and nothing is stored. No tools are used and no levers, bolts or wing nuts require turning. DESKOR CHAIRS are surprisingly simple in construction and easy for pupils to operate. Each unit (consisting of a chair and a "converter") is packed in an individual container and needs only to be fastened to the floor and have height of chair and desk adjusted.

When the "converter" is in position as a desk, the unit can be folded, to facilitate janitor service. This position creates aisles around each unit; another exclusive feature of DESKOR.

"Converter"

THE "CONVERTER" IS OPTIONALLY USED AS A DESK OR CHAIR

Chair



TWO FULL UNITS OF DESKOR CHAIRS

Showing one "Converter" in position as a desk and the other "Converter" as a chair with seat tilted. The two positions are not used at the same time

Photograph at right shows 12 students at *12 desks* in regular class formation. Note the usual aisles between each file of desks and the extra four unoccupied chairs in front row, making a total of *16 chairs* and *12 desks*

Photograph at left shows the same 12 students lifting their desks from the backs of the permanent chairs. These desks are inserted in aisles between permanent chairs ready to be converted into *12 extra chairs*

Photograph at right shows the same 12 students converting their desks into *12 assembly chairs*

Photograph at left shows the same classroom converted by the 12 students *in less than one minute* into an assembly room providing seating capacity for *28 students* thus increasing the seating capacity of the room 75%

IN NEW BUILDINGS DESKOR CUTS CONS

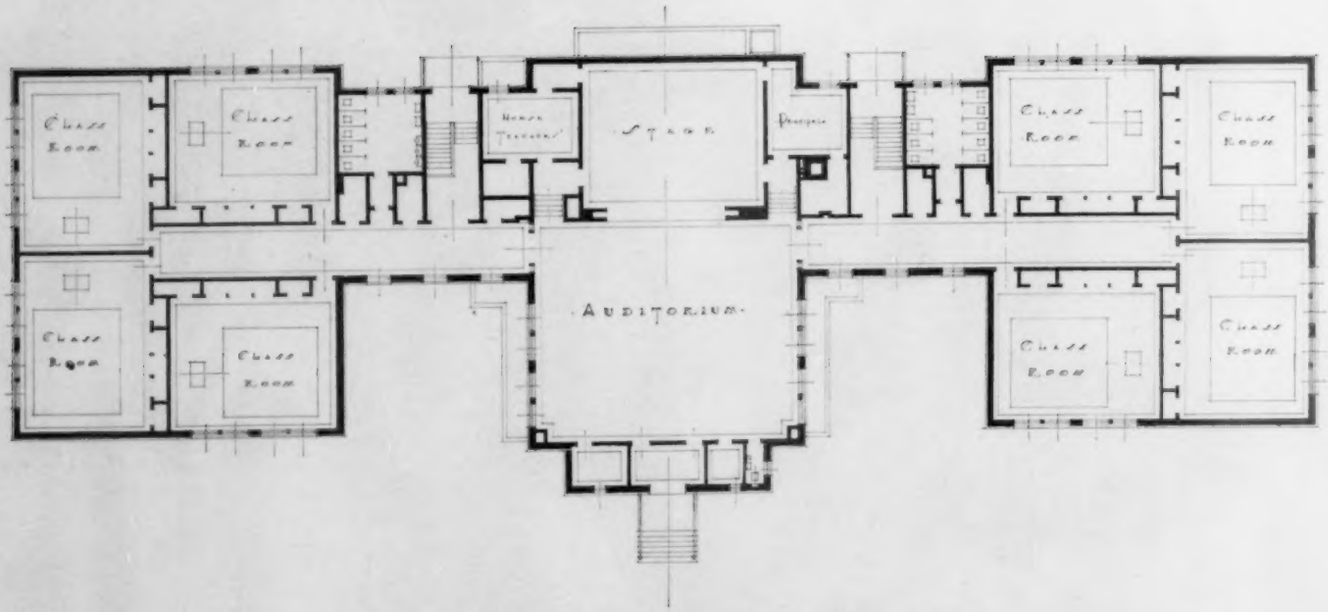
SPACE COSTS MONEY

In the planning of new schools architects and school officials should consider Deskor as of primary importance in the saving of space and money—and not merely as equipment.

The fundamental savings achieved through the use of Deskor are, first, the reduction of building costs and second, the permanent reduction in maintenance costs. Building costs are reduced by the elimination of inefficiently utilized space. In eliminating waste space the load of maintenance expense is permanently lightened.

The foregoing emphasizes the importance of incorporating Deskor in the original building plans.

Eastman Elementary Scho
Architect: Harold Holm O


Class Room
Class Room
Class Room

CONSTRUCTION AND MAINTENANCE COSTS

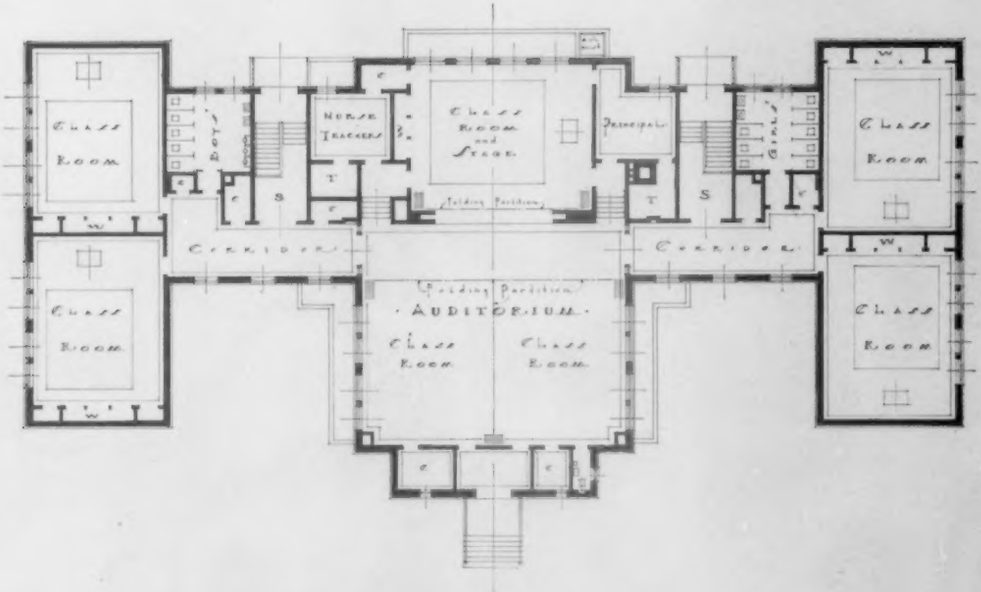
entary School, Concord, N. H.
d Holmes Owen, Concord, N. H.

A CONCRETE EXAMPLE

Space Reduced 30% In Eastman School

In planning this school, the architect, by incorporating Deskor convertible units in combination with folding walls made it possible for this building to be thirty percent smaller in floor area.

The dual use of auditorium and triple use of stage saved Concord, N. H., the cost of constructing four additional classrooms and saves the taxpayers each year the cost of maintaining this unnecessary space.



Eastman School *as built* the DESKOR way
Floor area = 8,422 square feet

IN OLD BUILDINGS DESKOR INCREASES

Dorchester High School for Girls, Boston, Mass.
Architect: Hartwell, Richardson and Driver

MULTIPLE USE OF EXISTING SPACE SOLVES OVERCROWDING

By equipping **existing** rooms or auditoriums with Deskor, additional pupil capacity is obtained. This effects substantial savings by eliminating the necessity of new construction.

A TYPICAL EXAMPLE

Dorchester High School for girls was built in 1901. In 1910 eighteen classrooms were added.

Additional classroom facilities were vitally necessary in 1931. Outmoded assembly hall seating was discarded from two large areas and Deskor convertible units were installed.

Thanks to Deskor these rooms still seat 897 pupils in assembly and at the same time provide study station facilities equalling in capacity eleven new classrooms.

Capacity WITHOUT NEW CONSTRUCTION

DORCHESTER HIGH SCHOOL FOR GIRLS

SAME ROOM

341 Desks—Study Formation

SAME ROOM

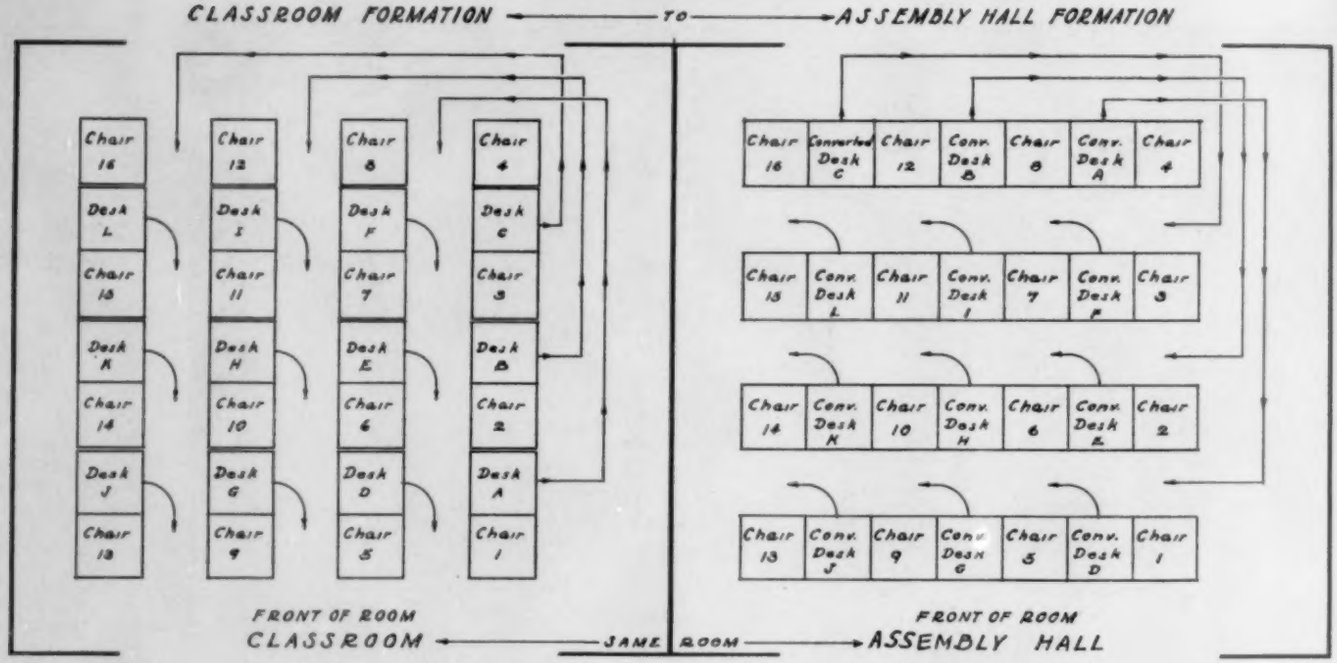
741 Chairs—Assembly Formation

The above Deskor installation at prices in effect in 1931 cost $13,455. Eleven new classrooms at prices in effect in 1931 would have cost approximately $200,000.

An additional room—lecture hall—(not illustrated) accommodates 156 pupils in assembly formation or 72 desks—home stations

DIAGRAM

SHOWING METHOD OF CONVERTING DESKOR CHAIR CONVERTIBLE UNITS EITHER WAY



Example:

Pupil sitting in PERMANENT Chair "16" uses Desk "L" which is attached to back of PERMANENT Chair "15."

To convert from CLASSROOM formation to ASSEMBLY HALL formation:—On signal from teacher, pupil rises and lifts the DESK, steps slightly to the LEFT (indicated by arrow) and inserts the DESK between PERMANENT CHAIR FRAMES "15" and "11" inverting the DESK at the same time. The inverted DESK has now instantly become an ASSEMBLY CHAIR between chairs "15" and "11." This procedure is followed by all other pupils with the following exceptions:—DESKS "A," "B" and "C" are taken by pupils sitting in chairs "2," "3" and "4" to the back row as indicated by arrow lines and are inverted in their respective positions as shown.

To convert from ASSEMBLY HALL formation to CLASSROOM FORMATION, reverse the above procedure as shown by ASSEMBLY HALL DIAGRAM.

Results:

A CLASSROOM or STUDY HALL with 12 DESKS—16 CHAIRS instantly converted to ASSEMBLY HALL formation with 28 CHAIRS or vice-versa.

Specifications for Deskor Convertible Units:

A DESKOR UNIT CONSISTS OF TWO SEPARATE PARTS: A STATIONARY CHAIR and A REMOVABLE CONVERTER

The stationary chair is of welded steel construction, substantially braced. The wooden molded chair seat, which may be raised or lowered, is equipped with friction stays and rubber bumpers to prevent slamming. The chair back composed of wooden slats riveted to steel, is inclined for correct posture. Under the seat is a steel book box 18″ x 11″ x 5½″.

The removable converter forms a tilted or flat desk surface when in position on the back of a stationary chair. It forms a molded wooden auditorium seat, complete with inclined back, when placed in position filling the aisle space between the stationary chairs. The conversion of a unit from classroom to assembly position is made by any pupil in less than one minute.

Deskor units are **completely adjustable** for all sizes of pupils from fourth grade to adult. Materials and construction are the best quality. All metal parts are finished in baked enamel; color, Deskor Green or School Brown. Wooden desk tops, seats and chair backs are of selected white maple finished with one coat of stain and three coats of lacquer.

CAPACITY CHART

This chart shows the maximum number of Chairs convertible into Desks which can be installed, in rows 32 inches apart, in any room over 20 ft. wide and over 24 ft. long.
The chart is also an aid to architects in determining the most economical size of a room for the number of seats and desks desired. Proper allowance should be made when wider aisles are required.
The upper figures in each block show the total number of Seats in Assembly Formation.
The lower figures show how many of said Seats are convertible into Desks in Classroom Formation.

	These figures are for seats arranged in a single section across the room. (No centre aisle). Each side aisle is 3 ft.wide. Total of aisles = 6 ft.				These figures are for seats arranged in two sections across the room 9,11,13 or 15 seats in each row. One centre aisle 3 ft. wide. Each side aisle is 30 in. wide. Total of aisles = 8 ft.				These figures are for seats arranged in three sections across the room; 11,13 or 15 seats in a row in each section. Two centre aisles each 3 ft. wide. Each side aisle is 30 in. wide. Total width of aisles is 11 ft.							These figures are for seats arranged in four sections acrpss the room; 11,13 or 15 seats in a row in each section. Three centre aisles each 3 ft. wide. Each side aisle 30 in.wide. Total aisle width 14 ft.				Width of room in the clear. (between projections)
WIDTH OF ROOM IN THE CLEAR	21'	24'	27½'	30½'	38'	44'	50'	57'	65'	68'	72'	75'	78'	81'	85'	92½'	99'	105½'	112'	
SEATS IN ONE ROW ACROSS ROOM	9	11	13	15	18	22	26	30	33	35	37	39	41	43	45	48	52	56	60	One row of assembly seats.
NUMBER CONVERTIBLE	4	5	6	7	8	10	12	14	15	16	17	18	19	20	21	22	24	26	28	Number convertible into desks.
ACTUAL DEPTH REQUIRED FOR																				
6 Rows = 14'-8"	54 24	66 30	78 36	90 42	108 48	132 60	156 72	180 84	198 90	210 96	222 102	234 108	246 114	258 120	270 126	288 132	312 144	336 156	360 168	
7 Rows = 17'-4"	63 28	77 35	91 42	105 49	126 56	154 70	182 84	210 98	231 105	245 112	259 119	273 126	287 133	301 140	315 147	336 154	364 168	392 182	420 196	
8 Rows = 20'	72 32	88 40	104 48	120 56	144 64	176 80	208 96	240 112	264 120	280 128	296 136	312 144	328 152	344 160	360 168	384 176	416 192	448 208	480 224	
9 Rows = 22'-8"	81 36	99 45	117 54	135 63	162 72	198 90	234 108	270 126	297 135	315 144	333 153	351 162	369 171	387 180	405 189	432 198	468 216	504 234	540 252	
10 Rows = 25'-4"	90 40	110 50	130 60	150 70	180 80	220 100	260 120	300 140	330 150	350 160	370 170	390 180	410 190	430 200	450 210	480 220	520 240	560 260	600 280	
11 Rows = 28'	99 44	121 55	143 66	165 77	198 88	242 110	286 132	330 154	363 165	385 176	407 187	429 198	451 209	473 220	495 231	528 242	572 264	616 286	660 308	
12 Rows = 30'-8"	108 48	132 60	156 72	180 84	216 96	264 120	312 144	360 168	396 180	420 192	444 204	468 216	492 228	516 240	540 252	576 264	624 286	672 312	720 336	
13 Rows = 33'-4"	117 52	143 65	169 78	195 91	234 104	286 130	338 156	390 182	429 195	455 208	481 221	507 234	533 247	559 260	585 273	624 286	676 312	728 338	780 364	
14 Rows = 36'	126 56	154 70	182 84	210 98	252 112	308 140	364 168	420 196	462 210	490 224	518 238	546 252	574 266	602 280	630 294	672 308	728 336	784 364	840 392	
15 Rows = 38'-0"	135 60	165 75	195 90	225 105	270 120	330 150	390 180	450 210	495 225	525 240	555 256	585 270	615 285	645 300	675 315	720 330	780 360	840 390	900 420	
16 Rows = 41'-4"	144 64	176 80	208 96	240 112	288 128	352 160	416 192	480 224	528 240	560 256	592 272	624 288	656 304	688 320	720 336	768 352	832 384	896 416	960 448	
17 Rows = 44'	153 68	187 85	221 102	255 119	306 136	374 170	442 204	510 238	561 255	595 272	629 289	663 306	697 323	731 340	765 357	816 374	884 408	952 442	1020 476	
18 Rows = 46'-8"	162 72	198 90	234 108	270 126	324 144	396 180	468 216	540 252	594 270	630 286	666 306	702 324	738 342	774 360	810 378	864 396	936 432	1008 468	1080 504	
19 Rows = 49'-4"	171 76	209 95	247 114	285 133	342 152	418 190	494 228	570 266	627 285	665 304	703 323	741 342	779 361	817 380	855 399	912 418	988 456	1064 494	1140 532	
20 Rows = 52'	180 80	220 100	260 120	300 140	380 160	440 200	520 240	600 280	660 300	700 320	740 340	780 360	820 380	860 400	900 420	960 440	1040 480	1120 520	1200 560	

21 Rows = 54'-8"	To determine the figures applicable to these greater depths, add together the figures for two rows which, together, would equal the number of rows permitted by the depth selected.	30 Rows = 76'-8"
22 " = 57'		31 " = 81'-4"
23 " = 60'	Example: 76' of available space would accommodate 29 rows which would be the total of the figures for 14 and 15 rows.	32 " = 84'
24 " = 62'-8"		33 " = 86'-8"
25 " = 65'-4"	Example: 84' of available space would accommodate 32 rows, or twice the figures for 16 rows.	34 " = 89'-4"
26 " = 68'		35 " = 92'
27 " = 70'-8"	16 inches is allowed for the depth of the front row, and 32 inches for the depth of each succeeding row.	36 " = 94'-8"
28 " = 73'-4"		37 " = 97'-4"
29 " = 76'		38 " = 100'

—Depths of Space for Seats—

To determine the depth of space available for seats deduct from the length of the room the width of the front aisle, the rear aisle and all other cross aisles (if any) measuring from the front wall (or from the front of platform or stage if any) to the rear wall of the room. When there is no platform or stage make proper allowance for teacher's desk (generally 7 feet from front wall to first row of chairs). For a class room an allowance of 3 feet for width of rear aisle is sufficient.

WIDTH OF ROOM—

Any excess in width of room over dimension selected for computation will increase the width of longitudinal aisles.

Example: For a room 59' wide (the shortest distance between projections from side walls) use the figures in the column headed "57'."

For a room 69' wide use the figures in the column headed "68'."

In the first case the aisle space will be increased from 8' to 10' and in the second case from 11' to 12.'

●

COMPUTATIONS—

If the length of a room is 75' from front of stage to rear wall, and an allowance of 15' is made for the front aisle, the rear aisle and a cross aisle, the remaining length is 60 feet which would accommodate 23 rows spaced 32" apart. Adding together the figures for 11 and 12 rows under the column headed "57'" would show that the total capacity is 690 assembly seats, 322 of same convertible into desks.

If the figures under the column headed "68'" are used the total capacity is 805 assembly seats, 368 of same being convertible into desks.

—Notes—

Rows must be in straight lines, preferably spaced 32" apart.

In some cases the assembly seating can be increased by installing an extra file of chairs (in one or more sections) with no space between it and another file of chairs; but such an arrangement does not increase the number of seats convertible into desks. Extra desks can be utilized but there would be no places for their conversion into seats. Seats can be installed on floors of any material and whether level or pitched.

"Deskor" registered U.S.A. Patent Office

DESKOR

(PATENTED)

A.I.A. File No. 35-B-3

CONVERTIBLE DESK OR CHAIR

DESKOR CHAIR SALES CORPORATION, BOSTON, MASS.

(To make a desk) ←——————→ (To make a chair)

HEYWOOD-WAKEFIELD COMPANY

Gardner, Mass.

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CLASSROOM SEATING

AUDITORIUM SEATING

Movable Desks

The Movable Desks in the Heywood-Wakefield line comprise all of the accepted types in steel and all-wood constructions. These include the Unit Movable Desk, an adjustable style with single unit underconstruction; Movable Chair Desks with Floating Arm construction; Steel Standard Table Desk and Chair; Study, Typewriter Tops on Unit Movable and other standards; and a complete line of classroom and lecture hall chairs. Also available are Chromium frame, streamlined desk and chair designs. All wood table and chair sets are made in standard and modern designs.

Fixed Desks

The Stationary or Fixed Desks in the Heywood-Wakefield line have steel underconstruction and steel side desk boxes. Adjustable types have a wide range of sizes which accommodate pupils of all sizes and ages, from kindergarten through college. The Fixed Desks include: Eclipse Adjustable Desk; Sanitary Pedestal Desk with adjustable and non-adjustable pedestals, a style designed particularly to promote classroom cleanliness; Combination Desk which has been in popular use for more than thirty years; Typewriter, Lecture Hall, Study Chairs as well as Teachers' and Visitors' Chairs.

Auditorium Seating

In the Heywood-Wakefield line are all-plywood; inserted panel; and full upholstered chairs. A splendid variety of cast iron and all steel end standards are available. On full upholstered auditorium chairs, a special Streamline Edge may be used on the backs. This edge, formed from heavy, cold rolled steel protects the upholstery from soiling by students' hands and assures longer wear. Special types of chairs which fasten to the face of balcony risers are also available. A complete line of folding portable assembly seating rounds out the Heywood-Wakefield Auditorium line.

Gymnasium and Stadium Seating

Heywood-Wakefield has furnished seating for major league baseball parks, prominent sporting arenas, jockey clubs, etc. These same seats have been installed in school and college gymnasiums and on athletic fields all over the country.

If you are selecting school or college equipment for new or replacement use, may we offer practical, experienced assistance in helping you solve any problems that may arise? A note to any of the offices listed above will bring detailed information without cost or obligation. We shall also be pleased to send you our latest catalogues.

GRAYBAR ELECTRIC COMPANY

Executive Offices: Graybar Building, Lexington Ave. and 43rd Street
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PRODUCTS

The Graybar Electric Company brings to meet any and every electrical need for schools and colleges more than 60,000 electrical supplies—supplies whose dependability is warranted by Graybar's 69 year old quality reputation.

The 84 distributing houses listed above bring these supplies within arm's reach of demand everywhere, making instantly available everything electrical, to transmit, apply and control electricity in school and college buildings.

INTER-COMMUNICATION

School boards, superintendents, and architects can well appreciate the importance of an interior telephone system that knits all the individuals of the teaching staff together—without, at the same time, requiring the services of an operator. Graybar Inter-Phones are simple to operate. The user merely pushes a button to make a connection.

In addition, Graybar supplies many other types of electrical signalling equipment for schools, including bells, buzzers, annunciators, and gongs of every variety with all accessory equipment. Write us for more detailed information.

PROGRAM AND SOUND SYSTEMS

We can now supply complete school systems covering Telephone Communication, Fire Alarm, Program Clocks, Laboratory Switchboard and Panels, Complete Public Address or the Program Sound System which is a two channel type arranged to provide pick up from microphones, phonograph reproducers or an all way radio receiver on either channel and will provide two programs simultaneously. It is possible to select any one of the pick ups, amplify it and distribute the program to any one or all the speakers in the class rooms at the same time.

LIGHTING EQUIPMENT

A complete selection of fixtures, glassware and accessory products to meet the specialized needs of school and college buildings is quickly available through Graybar.

Lighting specialists from Graybar can help architects and school boards secure the most efficient installation. The Graybar Electric Company has given the problem of proper school lighting special study and has developed the most complete line of lighting fixtures and glassware suited to school and college needs.

LAMPS

Mazda Lamps are available on quick call at Graybar Electric Company distributing houses located in 84 principal cities throughout the country.

These well-known, extremely efficient lamps are stocked in the five standard sizes—25, 40, 60, 100 and 200 watts—adopted to simplify ordering.

WIRE AND WIRING SUPPLIES

Graybar Electric Company distributing houses carry large stocks of wiring supplies for power, light and inter-communication construction and maintenance. This includes wire, conduit, wiring devices, connectors, etc., for all purposes. All materials are of the highest quality, the products of long established, well-known manufacturers.

60,000 OTHER ITEMS

The above products cover only a very small portion of the 60,000 products distributed by Graybar. For complete information covering these or other electrical products for schools and colleges address the nearest Graybar office, or Graybar Electric Company, Lexington Ave. and 43rd St., New York, N. Y.

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

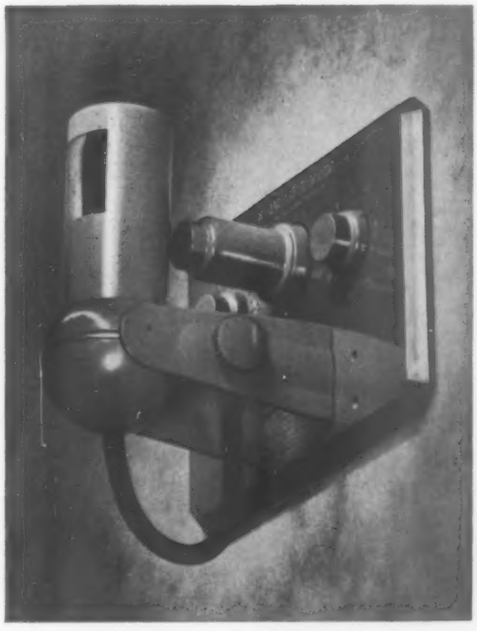
SALES OFFICES IN PRINCIPAL CITIES

GENERAL ELECTRIC AUTOMATIC LIGHT CONTROL

Assure Correct Schoolroom Lighting at All Times

In devising an inexpensive photoelectric lighting control unit for classrooms and study halls, the General Electric engineers have succeeded in solving a very vital school problem—the problem of minimizing eyestrain due to faulty lighting.

The application of the Photoelectric Relay to school-room light control is simple. A phototube, or "electric eye," is set up so that natural light from the windows falls on the tube. Variation in the amount of light striking the tube changes the current flowing in the tube. Amplified by a standard radio tube, this change operates a relay which in turn operates the lights.



G-E Light Sensitive Control Panel—CR7505D6A

Adjustment of the control unit is both simple and permanent. Two knobs located on the control panel in the room fix the light level at which the unit will turn on the artificial light and the level at which the artificial light will be turned off.

Two Types

Two types of G-E Automatic Light Control are available—**flush**-mounted, and **surface**-mounted.

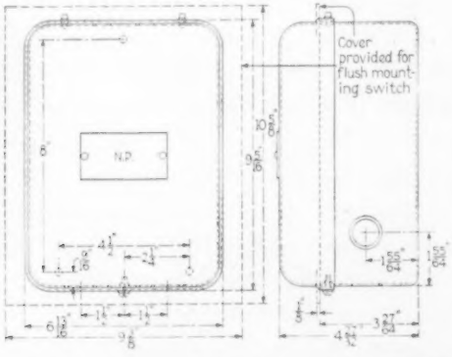
The **flush**-mounted model is best suited for installations in new buildings because it is to be installed on a three gang outlet box mounted in the wall.

The **surface**-mounted model can be used to advantage where it is not desirable to cut into the room walls.

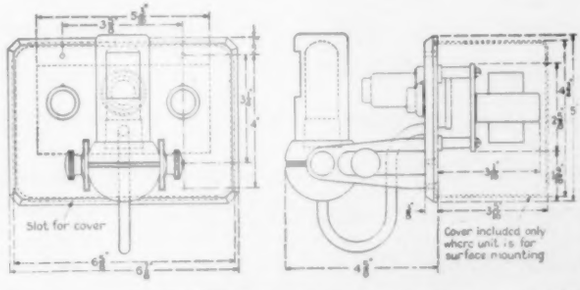
Connections to the lighting circuit of the building may be made at the regular wall switch.

Booklet

To those school executives or school architects interested in the details of G-E Automatic Light Control, we shall be glad to send a copy of our Booklet No. GEA-2606. Or a G-E representative will be glad to discuss classroom requirements with you, advising the proper type to meet your needs.



Dimensions of remote relay and magnetic switch CR7500-P2A, for operating the lights, flush- or surface-mounted



Dimensions of CR7505-D6A light sensitive control panel, flush- or surface-mounted

WESTON ELECTRICAL INSTRUMENT CORP.

601 Frelinghuysen Avenue, Newark, N. J.

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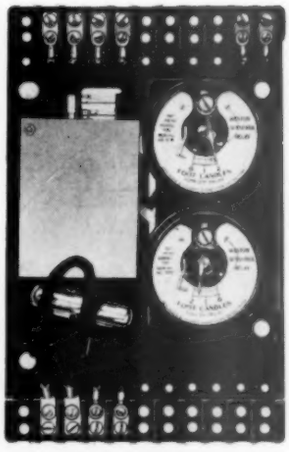
Improve classwork with proper illumination . . . *easy* with these WESTON Illumination Control and Measuring Devices

Note the tiny WESTON Photronic Cells on rear wall. These Cells automatically control the classroom lighting; turning lights on when needed and off when not needed

No longer is it necessary to theorize concerning the relationship between good lighting and good scholarship. In one school where adequate classroom illumination was provided and automatically controlled, failures were reduced by 60%. In another, a 28% improvement resulted from proper lighting. Similarly, schools in all sections of the country now measuring or controlling their illumination with WESTON Illumination Devices, report a marked increase in educational efficiency.



The WESTON Photronic Automatic Illumination Control Relay

To obtain these benefits of proper illumination, in old schools or new, is today a simple and inexpensive matter. Small, compact WESTON direct-reading light measuring instruments, placed on any desk or held in room location, instantly show the amount of light (artificial or daylight) available in that location. Thus you can make certain, by a quick periodic check, that each pupil has the proper amount of light for proper seeing.

And to be sure that students have proper illumination at all times . . . "lights on" when needed, but "off" when not needed . . . WESTON automatic Control Relays are being widely employed. This Relay automatically turns lights on when daylight falls below the proper level . . . during storms or on late afternoons . . . and automatically turns them off when nature's light is restored to that level. No attention is necessary; and the device costs practically nothing to operate. Ask us to send you complete information on all WESTON Illumination Devices. Weston Electrical Instrument Corporation, 601 Frelinghuysen Avenue, Newark, N. J.

Model 703 WESTON Foot-Candle Meter

SUNDT ENGINEERING CO.

AFFILIATE OF LITTELFUSE LABORATORIES

4254 Lincoln Avenue — Chicago, Ill.

SUNCO "SOUNDMASTER" PORTABLE AMPLIFIER

CUSTOM BUILT

Technically the Soundmaster has all the latest design features: It has a dual drive crystal microphone with hand stand and twenty-five foot cable; 6 tube amplifier, 126 D.B. gain, 12 to 15 watts output, two microphone and one phono inputs; for 110 volts, 50-60 cycles; 12 inch, 15 watt dynamic speaker. The case measures 14″ x 14″ x 9″ and is covered with extra heavy mahogany shark leatherette. Weight 32 lbs.

Complete — Ready to use. **Sent on two weeks' approval.**

LIST PRICE: $112.50

Less Educ. Discount $67.50

PHONO-SOUNDMASTER

The Phono-Soundmaster combination is ideal for music classes, school dances, gym exercises, etc. Hinges on the Soundmaster for carrying. The turntable has a Green Flyer Motor, 78 R.P.M. with governor and speed regulator; new offset crystal pickup, volume control, and new permanent osmium-iridium needle. May be used independently of the Soundmaster. Plays 10″ or 12″ records with excellent reproduction.

LIST PRICE $126.00 — **NET PRICE** $75.00

GREAT VERSATILITY

The Soundmaster will serve audiences up to 3000 indoors or out, and auditoriums up to 10,000 square feet and up to 250,000 cubic feet. It affords excellent sound reinforcement for lectures, debates, banquets, musicals, dances, picnics, athletic directing in the gym or field, etc. Also used for recording. May be set up by anyone in a few minutes.

Indoor Exercises

ILLUSTRATED CATALOG ON REQUEST

THE AMERICAN SCHOOL AND UNIVERSITY

NEOBEAM OSCILLOSCOPE

For PHYSICAL SCIENCE DEMONSTRATIONS

With its auxiliary equipment, the Neobeam Oscilloscope No. 151 enables the instructor to make factual and dramatic demonstrations in the field of sound. It visualizes WAVE FORM (timbre); FREQUENCY (pitch); and AMPLITUDE (volume). If desired, sounds visualized may be broadcast by means of No. 154 Dynamic Speaker.

Recommended for Physics Laboratory

Model No. 151—with inbuilt Output Meter

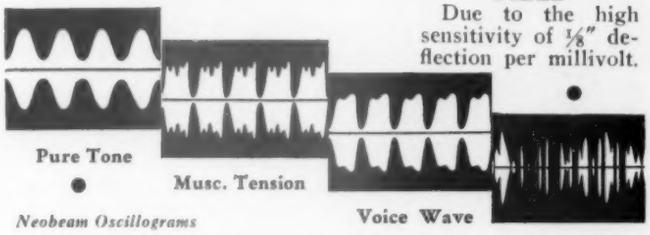
A highly sensitive, completely self-contained, portable unit operating on the modulated neon beam principle.

Wave Form

The built-in, high gain amplifier modulates a neon column constantly excited by radio frequency. The fluctuations of the neon column are observed in the scanning mirror, thus showing the exact wave pattern of potential or sound under observation.

IMMENSE EXPERIMENTAL FIELD

Due to the high sensitivity of ⅛″ deflection per millivolt.



Neobeam Oscillograms

VIBRATION STUDY

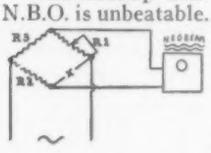
The No. 156 Vibration Pickup illustrated below is used with the Neobeam Oscilloscope to observe wave-form, frequency and amplitude of mechanical vibration. A special folder is devoted to this subject and will be furnished free on request.

INERTIA TYPE VIBRATION PICKUP NO. 156

When held against a vibrating body this pickup generates electrical impulses of a wave form corresponding exactly to that of vibrating motion.

A.C. BRIDGES

This hookup with N.B.O. is unbeatable.



NET EDUCATIONAL PRICES

No. 151 Neobeam Oscilloscope	$48.00
No. 150 N.B.O. (no output meter)	40.00
No. 152 Microphone, Illustrated	19.00
No. 154 8 Watt Dynamic Speaker	14.50
No. 156 Vibration Pickup (with output curve)	25.00

ALLIED RADIO CORPORATION

833 W. Jackson Blvd., Chicago, Illinois

ALLIED RADIO

CORPORATION

HOW TO USE *Radio Equipment* IN SCHOOLS

The use of radio-sound equipment in schools is now firmly established as an indispensable aid to the attainment of modern educational objectives. Facing educators today are the problems of how to select a combination of equipment best adaptable for the needs of the individual school and how to use such equipment to fullest advantage.

As a pioneer in the field of supplying sound service equipment for schools, ALLIED RADIO CORPORATION is prepared to offer invaluable assistance in solving these problems. Schools and colleges all over the country are now employing ALLIED equipment for the distribution of educational broadcasts within the school, for radio or speech recording purposes, for sound re-enforcement of musical and dramatic performances, and for other curricular and extra-curricular activities.

ALLIED'S Centralized Radio-Sound System, shown at left, is a typical example of the high-grade equipment now available. This system, designed and approved by Educators and Sound Engineers, offers the most convenient, effective, and economical solution of the school's radio problem. Educational radio broadcasts can be fed to all or to selected classrooms in the school; recorded programs, talks, announcements, and any other type of speech or musical activity may be distributed to any point within the school building. Other of its manifold uses are: sounding alarms, intra-mural communication, and class-dismissal signals.

The system, furthermore, offers the advantages of the "progressive" type of installation. Once the basic equipment is installed, additional channels or other features can be included as and when desired. This makes it possible for the school with a limited budget to add to its radio-sound system from year to year until the complete system is established.

Features of the ALLIED Centralized Radio-Sound System include: a powerful high-quality amplifier, all-wave radio tuner; 2-speed phonograph, program selector panels, speaker selection and distribution controls, volume level indicator, monitor speaker, and a crystal microphone—all contained in a single cabinet of handsome walnut. The system is adaptable to all school requirements and is exceptionally versatile.

The ALLIED Centralized School System is only one of a wide series of sound systems available for schools. Complete details and price quotations will gladly be sent on request. Every inquiry receives the careful attention of our Educational specialists.

PORTABLE SOUND SYSTEMS

In school auditoriums, gymnasiums, athletic fields, or wherever a permanent sound installation may not be required, ALLIED Portable Sound Systems are of incalculable value. Systems of this type may easily be set up wherever needed for temporary uses. The portable system illustrated is but one of the many quality units offered by ALLIED. It is entirely self-contained in a single portable carrying case. Features include: a full 18-watt public address amplifier, phonograph input, mixing controls, crystal microphone, and a 12-inch electro-dynamic speaker. Prices for this as well as for other ALLIED systems are eminently "budget-minded."

Free CONSULTING SERVICE FOR SCHOOLS

The extensive experience and valuable cooperation of our Educational Staff are at your service without cost or obligation. Our technicians are in constant touch with educators throughout the nation. Our understanding of your problems enables us to help you materially.

You are invited to submit your radio-sound specifications to us for careful consideration and expert advice. Years of experience in designing, constructing, and recommending equipment for hundreds of schools and colleges assure you of essentially useful and accurate recommendations.

Floor plans, sketches, or blueprints will be treated confidentially and returned safely. We shall be happy to quote exceptionally attractive prices for equipment to cover your requirements. Let us show you how radio-sound equipment can most effectively be used in your own school.

Schools with limited budgets can use radio-sound equipment to promote public interest and understanding and to justify further educational expenditures. Write us for complete details on how this plan can help you.

Write for free copy of our exclusive chart, "Using Radio-Sound Equipment in the School." This chart was prepared for the 1937 National Conference on Educational Broadcasting, and has been approved by prominent educators

AUDITORIUM USE

Adequate sound re-enforcement is a necessity for virtually every school auditorium. In the presentation of school plays, musical programs, lectures, or assembly programs, the use of an ALLIED portable sound system assures perfect sound amplification at low cost.

STADIUM USE

In the stadium or on the playing field, an ALLIED portable sound system provides greater enjoyment to every spectator. Announcements, bulletins, or running commentaries can be clearly heard in every portion of the field—only if suitable amplifying equipment is employed.

ALLIED RADIO CORPORATION

HOW SCHOOLS CAN USE RECORDING EQUIPMENT

More and more schools are recognizing the value of high-grade recording equipment to enliven and to enrich the curriculum. Many of the uses of recording equipment are obvious: classes in speech and in music make records to detect deficiencies and to provide accurate measurements of progress being made. Drama groups record "radio-dramas" for rebroadcast to school clubs and classes. School programs of permanent interest may be recorded and preserved for future repetition.

Other uses of recording equipment are now gaining recognition. In those instances where educational radio programs are being broadcast at times which do not coincide with class schedules, such programs may be recorded exactly and simultaneously as they are received and may be reproduced whenever, wherever, and as many times as desired. Interviews with visiting notables can be preserved and reproduced for indefinite lengths of time. Other valuable uses are being discovered constantly.

The recording equipment offered by ALLIED is distinguished for high fidelity range, ease of operation, accuracy of results, and economy both in initial cost and in operation. This equipment may be used together with or independent of the school's centralized or portable radio-sound system. Precision engineering, sturdy construction, and fool-proof operation provide for long-life dependability.

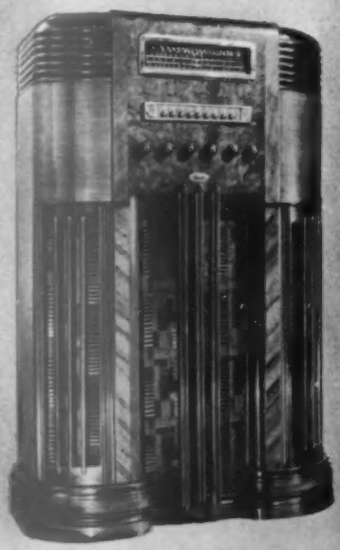
Several types of recording units are available at prices to fit your budget. Ownership of recording equipment is now entirely feasible by even the smaller schools. Recording discs, preservatives, recording needles and other accessories are offered for all requirements. Write for full details.

RADIO RECEIVING SETS AND PHONOGRAPHS FOR SCHOOLS

Educational radio programs are now widely accepted as a concrete, valuable contribution to the school experience of students in all years. Nationwide programs such as the "American School of the Air," Dr. Damrosch's "Music Appreciation Hour," and other programs broadcast specifically for school use are too valuable to be overlooked by schools which are not radio equipped.

To bring such programs to every school, at low cost, ALLIED offers its quality line of Knight Radios—in 61 models adaptable to any school situation. Knight Radios are available for operation on all types of current and for battery operation in rural areas. No school need deprive its students of the contributions radio can make. Every school can afford a series of Knight Radios for classroom use.

Latest models include radio receivers from 5 to 16 tubes for world-wide reception, high-fidelity radio-phonograph combinations, and portable models which may easily be carried from room to room. All Knight models incorporate latest features of circuit design and are licensed by R.C.A. and Hazeltine laboratories. Knight Radios have been tested and approved as "Best Buys" by a prominent consumer research organization.



ALLIED TRANSCRIPTION REPRODUCER

This fine new instrument answers the demand for a portable versatile, high-quality transcription reproducer and record-player. It is ideal for use in schools where true fidelity reproduction of all types of recordings is required. Versatile in operation (works equally well from A.C. or D.C.), the unit is conveniently portable. Features include: built-in powerful amplifier, dual-speed phonograph motor which will accommodate all records (8", 10", or 12") as well as 16" transcriptions. Crystal pick-up and high-fidelity speaker assure perfect reproduction, while built-in scratch filter eliminates all surface noise.

EQUIPMENT FOR SCHOOL LABORATORIES

For schools offering courses in radio or physics and for research laboratories, ALLIED can furnish all types of test or experimental equipment at lowest quotations. Oscillographs, Oscillators, Voltmeters, Ohmmeters, Ammeters, Photo-cells, relays, and a complete selection of parts are offered by ALLIED in all nationally known makes. Special equipment can be furnished with minimum delay. We urge you to consolidate your purchases for faster service and greater economies. Let ALLIED serve you with everything in radio.

KITS AND PARTS FOR RADIO CLASSES

To school classes and clubs studying radio and electronics, ALLIED offers a very wide selection of radio-building kits. Students obtain concrete experience in applying theory to practice and are able to observe the function of radio parts by building radio sets as class projects. We can furnish matched kits for building any type of radio circuit, as well as parts, tools, and textbooks. Wiring diagrams, parts lists, and engineering advice are available without cost to all radio or electrical class instructors or club sponsors.

WRITE FOR OUR FREE CATALOG

We shall be glad to send copies of our catalog for your control files and for reference by interested departments. It is the most complete radio supply book ever published. It will pay you to keep a copy handy for ready reference.

ALLIED RADIO CORPORATION

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RCA MANUFACTURING COMPANY, INC.

Camden, New Jersey

A Service of the Radio Corporation of America

Schools now Offered Complete Sound Service

Audible teaching aids of all types available to modern schools including everything from Victor Records to school sound systems. Free booklet describes all equipment

ONE of the major aids to modern teaching is the use of sound in schools. Each year the number of schools swinging over to this method of education increases. During the past few years the trend toward the use of sound as an aid to teaching has increased with surprising alacrity.

The use of sound in schools is not new. Over 26 years ago the Victor Talking Machine Co. established an Educational Department to assist schools in vitalizing music instruction. Today, phonograph records are simply an important part of the complete sound service that RCA Victor provides.

In addition to records made especially for educational use RCA Victor offers instruments for the proper playing of these records. Radio receivers, too, are now installed in scores of schools to take advantage of the many educational and music appreciation programs broadcast by the big networks and local stations.

Other sound equipment made available to all schools through the Educational Department of RCA Victor includes apparatus to meet many and varied requirements—voice recording equipment, laboratory test equipment, sound motion picture projectors. In order to assist teachers to make the most effective use of sound in education, RCA also offers books, pamphlets, charts and bulletins.

Many schools are taking advantage of the benefits derived from the use of RCA Victor school sound systems, portable public address systems and related sound equipment.

Some of the RCA Victor sound services for schools are described in the following paragraphs. For complete information write to the Educational Department, RCA Manufacturing Company, Inc., Camden, N. J., for your free copy of the interesting booklet "RCA Victor Sound Service for Schools."

Music Appreciation Books and Catalogs

These are invaluable guides for both teacher and student. Some of the books are "The Victor Book of the Opera," "What We Hear in Music," "The Victor Book of the Symphony," "Music and Romance," "A Lecture Laboratory Course in Appreciation and History of Music."

Victor Educational Records

A complete assortment is offered for elementary grades, intermediate grades, high schools and colleges. These include children's songs, instrumental music for ear training, rhythm study, singing games, folk dances, art songs, stories, fables, instrumental music for advanced study in tone color of instruments, music history, languages, literature, nature study, dictation practice, and scores of other subjects.

Victor Records are also available for music appreciation—accompaniments for group singing with band, organ and orchestra. In fact, there are Victor Records to illustrate all types of music. See your RCA Victor dealer or write for catalog information.

RCA Victor Library of Recorded Music

As schools become more and more frequent users of Victor Records for educational purposes they have become builders of record libraries. For this purpose RCA Victor offers a sectional record cabinet available in three parts. In this attractive cabinet records may be accurately filed and protected from loss or damage.

RCA Victor Record Players, Electrolas, Victrolas

A varied array of record playing instruments is offered to meet the different requirements of schools. An inexpensive record player which attaches to any AC radio and plays records **through the radio,** has proved very popular. RCA Victor also offers portable Victrolas. These are excellent for use in schools not having electric current. RCA Victor Electrolas offer outstanding reproduction.

RCA Victor Electrola Model R-96

RCA Victor Phonograph Radios

These splendid instruments meet the demand for a combination of phonograph and radio in order that schools may take advantage of educational radio programs as well as records.

RCA Victor Recording Equipment

A large number of schools have found excellent use for this apparatus. It is of the same excellent quality as that used in the largest and finest broadcasting studios for test and transcription purposes. Is used to meet practically all situations requiring extreme accuracy of recording and reproduction—especially fine for voice recording.

RCA Victor Radios

A wide variety of types is available—ranging from the extremely low cost table models to magnificent consoles containing latest and greatest features for finer performance. Some are designed especially for classroom use—others for use in the auditorium.

RCA Victor School Sound System

This apparatus permits broadcasting of either recorded or radio programs from one central point to the entire school. Can also be used for announcements, instructions, class and drill signaling, and for other similar purposes.

RCA Portable Sound Systems

RCA Portable P.A. System PG-114

For amplifying vocal and instrumental music, speeches and recordings of all kinds, these systems are excellent. Are used by many schools in auditoriums, gymnasiums, on playgrounds and athletic fields.

RCA Sound Motion Picture Projectors

This equipment employs the use of sight as well as sound in education. It is precisely the same equipment as that used in many of the finest theatres and auditoriums throughout the world. Available in many types of portable and permanently installed equipment.

RCA Portable Sound Motion Picture Projector PG-81

Modern schools **stay** modern with RCA tubes in their sound equipment.

For full information about these and other RCA sound services for schools get your free copy of the catalog "RCA Sound Service for Schools" which may be obtained by writing Educational Department, RCA Manufacturing Co., Inc., Camden, N. J., A Service of the Radio Corporation of America.

RCA presents the Magic Key every Sunday 2 to 3 P.M., E.S.T., on NBC Blue Network

WESTERN ELECTRIC COMPANY

New York, N. Y.

Distributor in the United States

GRAYBAR ELECTRIC COMPANY

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General Offices and Plant: 1261 Shearer Street, Montreal, P. Q.

Western Electric

SYSTEMS FOR AMPLIFYING AND DISTRIBUTING SOUND

General

Western Electric equipment picks up, amplifies and distributes speech or music to all parts of an auditorium—to any or all rooms in a building—or to a number of points out of doors. The source of the program may be (1) Microphones, (2) Record Reproducer, (3) Radio Receiver.

Developed by Bell Telephone Laboratories for the Western Electric Company, these systems assure high quality sound reproduction and utmost dependability.

Many up-to-date schools, colleges and universities in all parts of the country have found Western Electric sound distributing systems valuable—for both educational and administrative uses.

Description

While each installation is carefully planned to meet specific requirements, the low cost unit illustrated is adequate for all but very large installations. In one compact cabinet it contains a combination microphone and monitoring loud speaker—a record reproducer—a radio receiver—amplifiers—and keys for selecting loud speakers in as many as 60 locations.

So that two programs may be reproduced simultaneously in different rooms, two amplifiers may be provided. If it will not be necessary to reproduce more than one program at a time, the second amplifier may be omitted.

A valuable feature is the "talk-back" circuit which enables the school principal to carry on a two-way conversation with any room in which there is a loud speaker.

Microphone Circuits. There are three circuits which may be used for microphones in various locations. The Western Electric "salt-shaker" microphone—which picks up equally well from all directions—is especially recommended for use with this equipment.

Radio Receiver. An all-wave high fidelity receiver which brings in programs from domestic or foreign stations.

Record Reproducer. A two-speed phonograph turntable which plays all standard, laterally cut records.

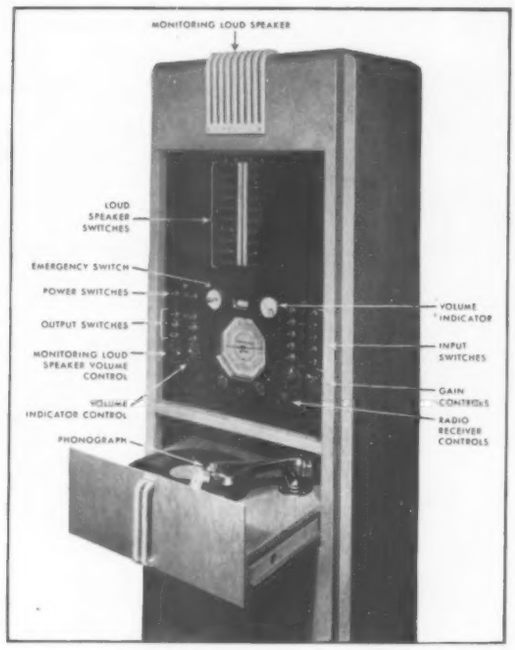
Cost and Service

In estimating the cost of installation, specific requirements must be considered. Graybar Electric Company engineers will gladly survey your buildings, recommend a system for adequate coverage, furnish complete specifications and an estimate of cost.

Stocks of spare parts are maintained at strategic points.

Roger Bacon High School, Cincinnati, Ohio—Western Electric equipped for many years

High School at Fairfax, Virginia—one of scores that use Western Electric sound distribution



Control Panel of Program Sound System

Uses in Schools

Sound distributing equipment is a valuable aid to teachers of languages, current events, music appreciation and other courses. It enables the principal to address all classrooms from his desk; delivers fire drill instructions and emergency announcements instantly; supplies music or voice amplification in gymnasium or auditorium. It is useful throughout the school day—yet costs but a few cents an hour to operate.

For full information, write to distributors listed at top of preceding page.

This attractive school at Millburn, New Jersey, is thoroughly modern. Another Western Electric user

THE AMERICAN SCHOOL AND UNIVERSITY

WESTERN ELECTRIC AUDIOMETERS

Poor hearing is often the cause of poor classwork. With the Western Electric 4B Audiometer, pupils' hearing acuity may be measured quickly and accurately—as many as 40 at one time.

This scientific instrument consists of a turntable with magnetic reproducer—and from 10 to 40 headsets through which pupils listen. It plays special records which are designed to show degree of hearing loss. Pupils write what they hear on data sheets. By checking these against a master sheet, even slight hearing defects are seen at a glance. Ask the distributors for new Bulletin giving full information.

WESTERN ELECTRIC AUDIPHONES

Air Conduction Type

Bone Conduction Type

For the hard-of-hearing, Western Electric makes individual Audiphones using either air conduction or bone conduction receivers. These are available in varying models to meet specific needs.

There is also the Western Electric Group Audiphone. With this equipment, the speaker's words are picked up by a microphone, are amplified, and delivered through light weight, individual headsets. Further details from the distributors listed on preceding page.

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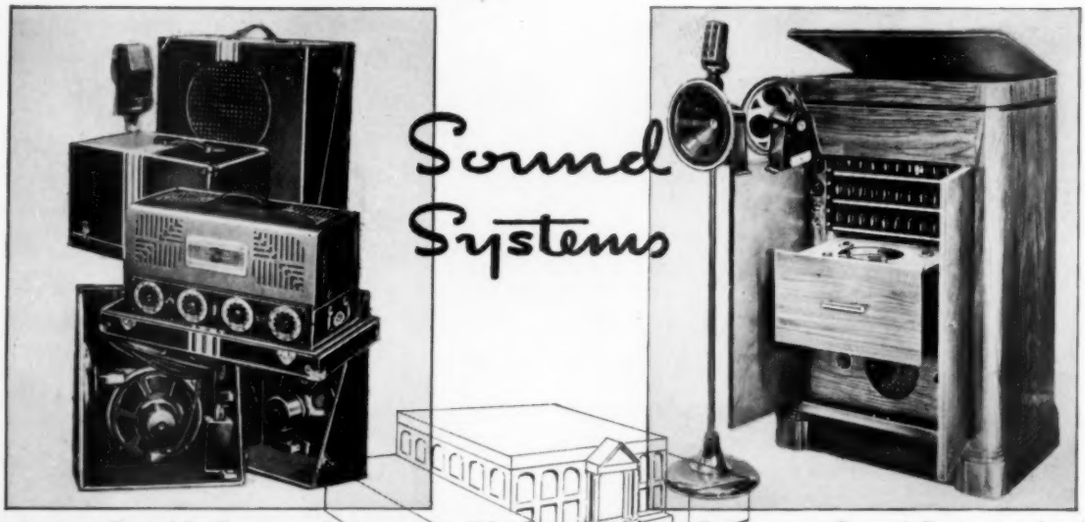
modernize with LAFAYETTE equipment!

PORTABLE

Modern sound equipment has become essential to efficiency in the school of today. Lafayette Public Address Systems provide the answer to this very real need. Avail yourself and your school of the countless benefits that a Lafayette Public Address installation will bring you. Our engineering staff will be pleased to give individual attention to your inquiry.

PERMANENT



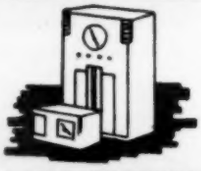
Sound Systems

The Lafayette Portable System obviates the difficulty of making yourself heard in large halls, gymnasiums, outdoor meetings, etc. It can easily be carried from one part of the school to another. No longer will it be necessary to make constant entreaties for silence. For the sake of student discipline, your own piece of mind, and education in general, get a Lafayette Portable System for those places in your school where it is "hard to be heard".

Lafayette Permanent Sound Systems should be installed to give all your students an equal chance to hear what's going on. A Lafayette Custom-Built Sound System that can be built to your specifications, permits inter-communication between classroom and principal and vice versa. Backed by 17 years of experience, incorporating the latest scientific improvements, Lafayette Systems are the "best buys" in the field.

P. A. ACCESSORIES

The very latest equipment to fill your needs. Microphones, speakers, cables—everything to further round out your present system. Our advisory staff will cheerfully answer your written inquiry.

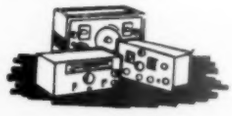


RADIO RECEIVERS

Introduce your students to the educational programs and the recorded masterpieces by means of the radio of perfect reproduction—the LAFAYETTE. From classroom midget sets to phono-radio combinations.

LABORATORY EQUIPMENT

Let your applied science students profit by the latest advances in the field of radio. Laboratory equipment bearing the LAFAYETTE stamp is the finest money can buy. Complete range of tubes, parts, etc.



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Geography, mechanics, applied science—let your students learn the enjoyable and practical way. Buy a shortwave set in its entirety or purchase parts and build one. The FREE catalog offered explains fully.

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It Costs No More to Have the Best

Assure Your Pupils Constant Clear Distinct Reproduction

Model N12JL
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Ever-wearing steel wall mounting cabinets with
a soft suede finish equipped with Nokoil Reproducers make ideal school speakers

- CLASS ROOMS
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Model TBUA
"Talk-Bak" Unit

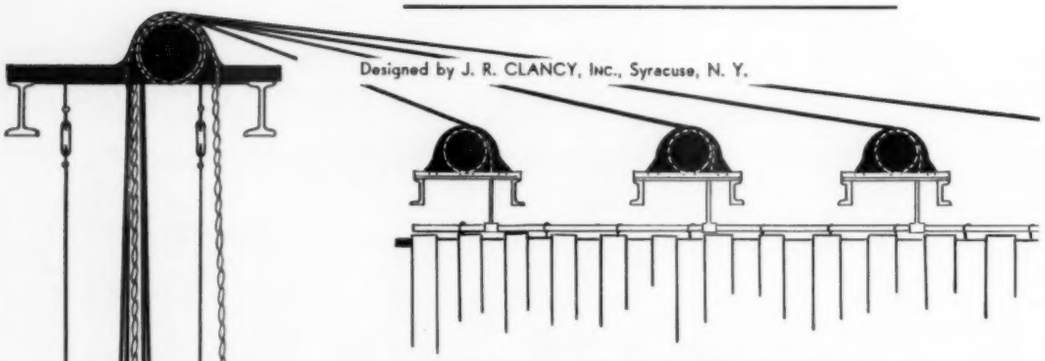
- EFFICIENT
- DURABLE
- DEPENDABLE

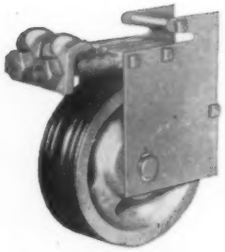
"Talk-Bak" units manufactured for inter-communication systems are also adaptable for inexpensive, efficient school sound installations. Write for complete information regarding these units. Also for general catalog

J. R. CLANCY, INC.

Stage Rigging and Equipment For School or College Auditorium Stage

Syracuse, N. Y.





Clancy Underhang Head Block

Clancy Head Block

Clancy Combination Floor Block and Rope Lock

PLANNING AN AUDITORIUM STAGE

A stage should last for the life of an auditorium—regardless of the amount spent on it. For this reason, the appropriation should be used to best advantage. A CLANCY planned stage is the answer to this problem.

Without obligation to you, we will plan and design your stage, advise as to the equipment required and assure you the most for your money. We have been designing and equipping practical stages of all sizes and types for 53 years. In this time we have planned many of the smallest school and college auditorium stages as well as stages in many of the greatest theatres in this country and abroad.

A CLANCY planned stage provides the utmost in flexibility. It assures a stage for every occasion—lectures, public functions, style shows, motion pictures and sound, concerts and legitimate as well as amateur stage presentations. Regardless of the size, the cost of a CLANCY planned stage is surprisingly low because it is designed for economy as well as efficiency and safety.

A CLANCY planned stage assures the utmost in service because we have the most complete line of stage rigging, equipment and hardware in the world. We do not adjust a stage plan to meet the limitations of items available—we have just the right unit for every particular need.

Our engineering service is free to all school and college executives, architects and contractors. Write us for any information you may desire.

CLANCY DRAW-CURTAIN TRACK

An ideal unit for use where sufficient height is lacking for a curtain hoist. Opens and closes curtains smoothly, evenly and quietly—in soft, flowing folds.

COMPLETE CATALOG—FREE

Write for our complete catalog of stage equipment. It will be sent free on request.

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Established 40 Years

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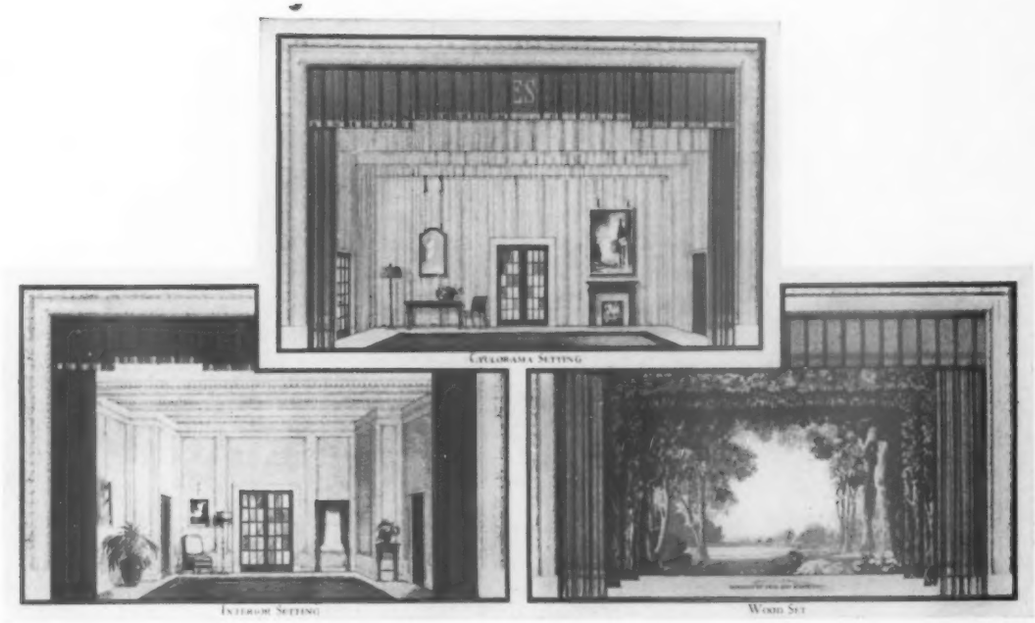

WE SPECIALIZE IN

Stage curtains, auditorium draperies, cyclorama settings, stage electrical equipment, lighting, rigging, hardware and curtain tracks.

Expert advice furnished for planning your stage and estimates submitted without charge.

Just check the items given below in which you are interested and call, or write, to our nearest office and we will be glad to give you complete information.

CURTAINS	STAGE EQUIPMENT	ELECTRICAL
STAGE CURTAINS	SCENERY	FLOOD LIGHTS
WINDOW CURTAINS	PICTURE SCREEN	FOOTLIGHTS
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CYCLORAMA SETTINGS	STAGE PROPERTIES	SPOT LIGHTS
CURTAIN MOTOR	STAGE RIGGING	BORDER LIGHTS
CURTAIN TRACK	STAGE HARDWARE	OLIVETTES
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VOLLAND STUDIOS, INC.

3737 Cass Avenue, Saint Louis, Missouri

IN THE PAST 10 YEARS . . . we have filled 3000 orders for custom-built Stage Equipment.

These orders came from all parts of the United States as well as Canada, Cuba, Canal Zone and Australia.

They asked us for everything from 70 complete sets of T-bar rigging to a frame for a Casement window.

Many of these were orders for **additional** equipment, for once an order is placed with us all data necessary for further estimates is carefully filed away. In this way Stage Equipment can be purchased in units as your budget permits.

These 3000 orders may be found on school platforms in the smallest of villages and on the stages of million dollar High Schools in many cities.

Our equipment is built to be operated by the students, and all the strain and stress incident to the operation of old-fashioned equipment has been eliminated by the use of the most modern types of material and the simplest operating mechanisms.

Our specification and budget service on all types of Stage Equipment is at the disposal of Superintendents, Architects and School Officials.

THE REDUCTION CYCLORAMA SETTING which we introduced in 1921 has become a vital part of the Stage Equipment of many schools.

It provides an elastic Setting which can be used for a full stage Operetta or can be quickly and easily reduced in size to a setting small enough for a lecture.

Our noiseless, all-ball-bearing SELF-PLEATING Track operates so as to pleat more and more fullness into the Curtains as they open rather than bunch up at the center as with the ordinary push-back type Track, while the mechanism on our exclusive all-ball-bearing BACK-DRAW Track is so arranged that when the Curtain is drawn away to disclose the stage, no gathering of the Curtain sections takes place anywhere except at the extreme outer end portions of the Curtain.

Our painted Scenery is built of clear, well-seasoned White Pine lumber using mortise and tenon construction, and is painted by competent Scenic Artists using only the finest water colors.

Write us regarding YOUR stage requirements and include 5 stage dimensions: Height and Width of Proscenium Opening, and Height, Width and Depth of the stage proper.

STAGE EQUIPMENT OF MERIT SINCE 1869

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I. WEISS AND SONS, INC.

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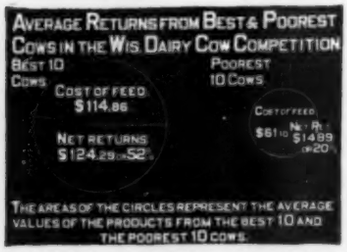
Willson's Gummed Paper Letters, Figures, Symbols and Tape are die-cut from best quality glazed, waterproof, gummed paper. They are easily applied and attractive in appearance.

PACKING

Letters and figures are packed 10 of a character to an envelope or 100 of a character to a box. Symbols are packed in boxes of 100 only. Assortments of 1,000, 2,000 or 5,000 characters are the convenient and economical method of purchase, the envelopes and boxes being purchased as refills as needed for the handy assortment boxes.

STYLES

Three styles of letters and figures are available —Cheltenham, Block and Gothic. These styles have been standardized because of their legibility and general acceptance as most desirable for display lettering. Sizes from ⅛-inch to 4 inches high.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Willson's Gummed Paper Letters, Figures, Symbols and Tape are especially adapted for making flash cards, analytical charts and graphs, signs, indexes, marking files, records, maps, etc. Used in every type of educational and administrative work.

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Standard stock colors of letters and figures are white and black. Symbols and tape carried in white and black. Special colors cut on order. Send for catalogue.

"Entire Strip Changed with One Movement"

Willson's Gummed Paper Letters and Figures are used widely in school cafeterias, with our Ladder Menu Rack shown here, one of several types. Write for particulars on Cafeteria Sign Equipment.

CHANGEABLE SIGNS AND BULLETIN BOARDS

Changeable Letter Signs provide the ideal medium for transmitting thought by means of the written word, combining all the elements of expensive hand lettered or printed signs with greater efficiency, convenience and economy. But they go beyond the ordinary field of printed or hand lettered signs and find a broad, prolific industrial field as well.

Send for complete catalogue.

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THE AMERICAN SCHOOL AND UNIVERSITY

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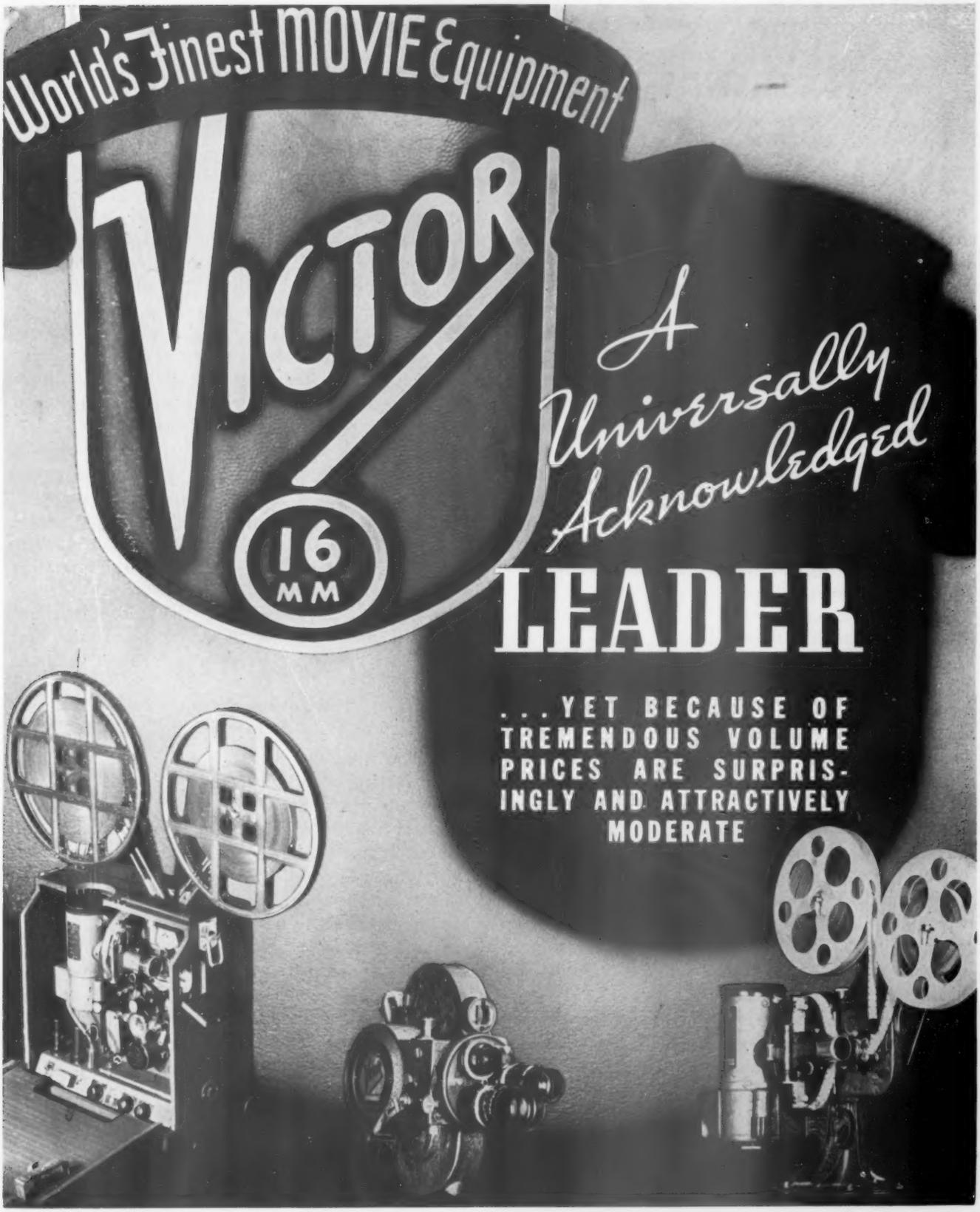


SECTION VIII
COMMERCIAL DEPARTMENT—ADMINISTRATIVE OFFICE

TRENDS IN BUSINESS EDUCATION

By RAYMOND C. GOODFELLOW

Director of Business Education, Newark, N. J.

BUSINESS education was given very little attention prior to 1900. Business colleges were dotted here and there throughout the country, and were the only schools wherein young people could obtain training in fundamental business subjects. Though most of these schools taught only bookkeeping, shorthand and typewriting at that time, they did a good piece of work and deserve great credit for their pioneering accomplishments.

Between the years 1900 and 1910, a few high schools in various parts of the country introduced from one to five business subjects. As the field was an entirely new one, much caution was used in developing courses. Academic high schools did not look with favor upon the introduction of business courses, since they tended to detract from the cultural and esthetic objectives set up in these schools.

In 1910 the complete statistics of the United States Bureau of Education showed the following conditions in business education: 66 universities and colleges giving commercial courses, with an enrolment of 5,800; an enrolment in such courses in public high schools of approximately 81,000; and in private commercial and business schools, an enrolment of 135,000.

From 1910 until the present time, business education in the high schools has grown rapidly. Statistics for 1936 showed that over 2,000,000 pupils were regularly enrolled in business courses in the high schools of the United States—an increase of 2,500 per cent during the 25-year period. In 1890 only 15 subjects were offered in the high schools of the United States; whereas in 1936, 239 subjects were taught, a large proportion of them in the business and social economic field.

Commercial education presents one of the greatest challenges in the history of secondary education. If business education is to function properly for these 2,000,000 young people, the basic subjects—bookkeeping, shorthand and typewriting—must be developed in harmony with modern business practices. Habits and skills basic to these subjects must be mastered and reasonable standards set up and maintained.

The college and university, the secondary school, the private business school, all have their place in training and developing business workers and leaders in the field of business education. Higher standards should be demanded by teachers in order that the pupils may attain proficiency that is acceptable to the business world. Too much emphasis cannot be laid upon further advanced training of teachers.

One may ask what becomes of this great army of high-school pupils who are selecting the business and secretarial courses in our high schools. The answer is that approximately 25 per cent of this number enter the field of business shortly after leaving school. The remaining 75 per cent use indirectly the information gained through a knowledge of the subjects given in these courses. In other words, the field of business education furnishes a type of consumer education that will remain valuable throughout the life of the individual.

The Changed Curriculum

What the future trends in business education may be is hard to predict, because of the readjustment in the social and economic factors of our national life. Many subjects formerly taught have practically disappeared from the field of secondary education. Latin and Greek were considered a necessity fifty years ago; today Greek is practically an unknown subject, and the number of pupils taking Latin in the high schools has greatly diminished. Modern languages, likewise, are having difficulty in maintaining the interest of high-school pupils.

Bookkeeping, shorthand and typewriting, or what may be known as the basic or vocational studies, are more popular today than ever before. We find that, in addition to these basic subjects, many others are being introduced that have a definite value in the field of business education. For instance, junior business training is being taught, in the ninth year,

in a majority of the high schools of this country. Commercial geography has likewise become a fixture in business and secretarial courses because of the wide acquaintance it gives high-school pupils with trade and travel. Business organization, history of commerce, and commercial law, together with many other courses too numerous to mention, are found in practically all our larger high schools.

Office Machines

The subject of office practice was scarcely known 25 years ago. Today we find high schools by the hundreds equipped with batteries of all types of calculators, adding and bookkeeping machines, voice writing equipment, duplicating machines, and, in fact, all types of office machines found in the business offices of any city.

Surveys are constantly being made to determine what the business man needs most in the efficient handling of his office work. Many of our larger industries use thousands of office machines, and it behooves the modern high school to introduce this equipment and train competent operators in this important field.

No doubt many changes will take place within the next few years. The writer believes that within a very short time the standard typewriter, as we know it, will become obsolete. Typewriter engineers are constantly working to lessen the noise of this very useful piece of office equipment. Noiseless typewriters are being used more extensively today than ever before, and it is only a question of time when the present type of standard machine will completely disappear. Voice writing equipment will be developed to such a degree that more work will be done with this equipment than will be accomplished with the writing of shorthand. Within the next twenty-five years, the writer believes, the emphasis on shorthand will be greatly reduced and the subject may possibly be omitted from the high-school program of studies. All courses now found in business curricula will be refined and improved; as times change, material will be deleted and the courses made more practical for the boy or girl taking them.

The surface has hardly been scratched in the matter of business education as compared with its possibilities in the next twenty-five years. This is as it should be. As business leads the way, the schools will shape their courses to conform to the needs of business. For the large army of high-school pupils who will enter business offices, it may safely be said that their education will conform to a type that will better fit them for the business field.

School Furniture

The manufacturers of school equipment should give more attention to the question of equipment that will be used in the high school of the future. School furniture should be made more comfortable and better adjusted to the needs of the pupil. Very little, if anything, has been done in the matter of typewriting tables and chairs for comfort and efficiency in the training of high-school pupils. Practically the same furniture is used today for this subject as was used twenty-five years ago. The drop-head typewriter desk has not been improved to the point where it will stand much hard usage. These desks, even in business offices, are inefficient because they require too much care and attention. The average bookkeeping desk, found in business departments, is not fitted to the needs of the pupil. School furniture engineers should give greater thought to this phase of business education.

To correct many of the abuses of school furniture, it would seem advisable that more thorough studies be made, and that the manufacturers of all types of school equipment consult leaders in this field for suggestions for overcoming the deficiencies found in a large number of types of school furniture used at the present time.

THE AMERICAN SCHOOL AND UNIVERSITY has accomplished much in bringing together a large amount of information regarding schools and their equipment. It is suggested that this institution could be chosen as a clearing-house for ideas that would benefit the manufacturers of school equipment, and in turn add greatly to the comfort and efficiency of those who are to use this equipment.

PROVIDING SUITABLE FACILITIES FOR COMMERCIAL INSTRUCTION

By PAUL M. BOYNTON

Head of Commercial Department of Bridgeport Central High School, Bridgeport, Conn.

EQUIPMENT for commercial education has undergone many changes since the invention of the commercial typewriter in 1879. Previous to that time, commercial education was largely in the hands of itinerant teachers who traveled from town to town giving instruction in penmanship, arithmetic, and bookkeeping. The equipment that was needed for such schools in those days consisted of a room located near the industrial center of a city where employed persons or those who wished to secure employment could get some specific clerical practice.

By 1890, commercial education was entering the public high schools, and by 1910, expensive layouts in rooms were provided for teaching the practice of banking and bookkeeping, accompanied with all the paraphernalia that go with the paper work in bookkeeping.

This has all changed. Expensive imitation banks are no longer necessary. The amount of paper work has been greatly reduced, and the teaching of bookkeeping has been simplified.

The small rural high school can never expect to give up-to-date vocational training in commercial education, except in the rudiments of shorthand, typewriting, and bookkeeping, because of the expense involved in equipping classrooms for the teaching of machine clerical practice or commercial geography. An adequate course in clerical practice should be so planned, from the point of equipment, that all the standard makes of up-to-date, modern, labor-saving clerical machines, like adding machines, subtracting machines, and computing machines, are taught.

To these must be added billing machines, duplicating machines, and, of course, the typewriter. In addition, the use of transcribing machines should be taught. The probable cost of a classroom equipped with these machines would be approximately $8,000.

Commercial education is vocational education, and vocational education, to be of any use in the community that it serves, must be conversant with that community's needs. To know the community's needs, a local survey should be made, and on the basis of those needs equipment can be purchased that will be commensurate to the task at hand.

It is a well-established fact that neither stenographic nor bookkeeping training alone is a satisfactory preparation for clerical duties. The few courses in office practice that are now being offered in high schools are totally inadequate in equipment to meet the requirements if filing clerks, calculating-machine operators, and duplicating-machine operators are to be trained vocationally.

A regulation size classroom could be used for the machine clerical training work. The desks should be removed, and the room should be divided into ten or twelve sections, one aisle running down the center of the room. Ordinarily, office railings could be used to

Teacher's Office
- 1 desk
- 1 chair
- 1 four-drawer vertical file
- 1 stop-watch

Conference Room
- 12 armchairs
- 3 tables

Mailing Department
- 3 tables
- 1 addressing machine
- 1 envelope opener
- 1 envelope sealer
- 4 chairs
- 6 trays

Invoicing and Billing Department
- 1 Elliott-Fisher
- 1 Remington
- 1 Underwood
- 1 billing machine
- 4 tables
- 5 chairs

Typing Department
- 6 typewriter desks
- 6 chairs
- 1 table
- 1 decimal tabulator
- 5 typewriters
- 1 chair
- 1 interval timer

Bookkeeping Machine Department
- 4 chairs
- 1 Burroughs
- 1 Underwood
- 1 Remington
- 1 Elliott-Fisher
- 1 Dalton
- 1 National

Filing Department
- 1, or more, Yawman and Erbe outfits
- 1, or more, Library Bureau outfits
- 1 paper fastener
- 1 numbering machine
- 1 wire basket
- 1 table
- 3 chairs

Dictating Machine Department
- 6 combination typewriter desks
- 6 typewriters
- 6 typists' chairs
- 6 transcribing machines
- 1 dictating machine
- 1 shaving machine

Adding and Listing Machine Department
- 1 Burroughs
- 1 Sundstrand
- 1 Dalton
- 4 chairs

Duplicating Machine Department
- 1 multigraph outfit
- 2 Mimeographs
- 6 Hectographs
- 2 tables
- 4 chairs

Calculating Machine Department
- 6 Monroes
- 6 Comptometers
- 6 Burroughs
- 6 Daltons
- 6 Sundstrands
- 6 Marchants
- 2 tables
- 8 chairs

Furniture and machine equipment suggested for the commercial department of a modern high school

mark the divisions. At one corner of the room the teacher's office could be located and a semi-glass partition erected around it.

The subdivisions suggested are as follows: teacher's office, conference room, mailing section, voice writing section, bookkeeping machine section, billing machine section, adding and listing machine section, Mimeograph and Hectograph section, filing section, advanced stenographic practice section, and typing section. To this could be added a calculating-machine section if this phase is not taught in a separate room containing calculating machines. The same is true of the filing section. If the filing is taught as a separate course, it may be eliminated from this set-up.

The Use of Motion Pictures in Commercial Education

Motion pictures can be used to advantage for the teaching of handwriting by showing pupils proper and improper techniques, the difference between good and poor writing, and how to make certain letters, which cannot be shown in a printed book. For example, pictures showing how to make the letter "x" without lifting the point of the pen from the paper can be taught by the use of motion pictures, but cannot be taught just from a penmanship handbook.

A more valuable use for motion pictures, however, is in teaching salesmanship and commercial geography. Corporations are glad to furnish films, to be shown before sales classes, that have been prepared for their own organization. The Y.M.C.A.; Bray Pictures Corporation, New York City; Rowland-Rogers Production, New York City; National Cash Register Company, Dayton, Ohio; General Motors, Detroit, Mich.; Ford Motor Car, Detroit; Dictaphone Sales Corporation, Bridgeport, Conn.; and many other companies, have available material.

The use of motion pictures in commercial geography is even more extensive. There are many industrial and commercial films showing almost everything from telephoning to canning codfish. A list of educational films can be secured from the Visual Education Society at Harvard University.

A Commercial Museum for the Teaching of Economic Geography

To start a commercial museum, begin with a display cabinet in which can be put samples of the various commodities exchanged in international trade. The order of sequence can be any order that meets with the approval of the teacher. For example, start with the cereals, and, beginning with wheat, go through the list of cereals, labeling the various ones and displaying them in small glass jars. Next can be taken the fibers, starting with the animal fibers, then proceeding to the vegetable fibers. This can be continued until all commodities are covered.

The museum will slowly grow. The exhibit should show the varying steps from raw material to finished product, whenever possible. To this should be added magazine files, newspaper clippings, descriptive pamphlets, and the *National Geographic,* which is probably the best source of material if a complete set can be obtained. The greatest value to the students is obtained by having them build up the exhibits in the museum and add to the clippings in the files.

As the museum grows in size and value, it can be moved to a special room given to the teaching of commercial geography or to the basement of the school, if there is any available space in one of the storerooms.

Practically all companies are willing to cooperate with a teacher in building a museum, and local industries will contribute valuable exhibits which can be tied up with the teaching of the geography of the city and town where the school is located. I believe that commercial geography should start from the high school and spread out to cover the state and then the nation, then our nearest neighbors, and finally the world. By proceeding in this order, a logical sequence is built up that appeals to the average commercial geography pupil.

The economic geography classroom should be equipped with wall maps of each section of the United States and possessions, and maps of all the continents. Also, blackboard outline maps of the United States and the world are desirable. A large globe with stand should be available.

SECRETARIAL PRACTICE SET-UP IN THE SENIOR HIGH SCHOOL, NEW ROCHELLE, NEW YORK

By WALLACE B. BOWMAN

IN many school systems the terms "Secretarial Practice" and "Office Practice" have been synonymous and have been used to designate a variety of classwork ranging from advanced dictation to the operation of office machines. This indiscriminate use has led to confusion and misunderstanding. In New Rochelle we have attempted to set up three separate courses with definite purposes for each:

Secretarial Practice is an advanced course planned for stenographic students. It gives instruction and practice in that phase of office work definitely related to the stenographic department of a business.

Office Practice is a course planned to give senior students instruction and practice in office work of a clerical nature.

The third course, known as Office Machines, is designed to develop a usable skill in the operation of such office machines as calculators and bookkeeping machines.

There is of necessity some overlapping of subject matter in the Secretarial Practice and the Office Practice courses, but it is seldom that a student elects both courses.

The Secretarial Practice class was set up in conformity with the Secretarial Practice Syllabus distributed by the New York State Board of Education in 1935. The purpose of the course as expressed in the Syllabus is to prepare students for high-grade stenographic work by:

(1) Increasing the shorthand recording speed to 100 words a minute on average business material;
(2) Raising the transcription speed to 20 words a minute;
(3) Developing a practical ability to handle advanced typewriting problems;
(4) Giving training in those secretarial duties that could be best learned in school, with due consideration to equipment and time.

In the New Rochelle set-up the shorthand recording and transcription speeds and the problems of advanced typewriting are treated through daily class assignments. The secretarial duties, however, are practiced through individual jobs arranged in a fashion somewhat similar to the organization of a large office. The accompanying floor plan shows a class accommodation for 26 students and is designed for instruction on the rotation plan.

Desks 1, 5, 6, 7, 8, 9, 10, 11, 12, 17, 18, 19, 20 are drop-top typewriter tables. Desks 2, 3, 4, 23, 24, 25, 26 are standard flat-top typewriter tables. Desk 21-22 is a flat-top table, 30 x 40 inches, used for editorial work. Desk 13-14-15-16 is a flat-top table, 36 x 60 inches, used for mail routine. All tables except the last two are equipped with typewriters.

The file M contains three alphabetic letter files, three numeric letter files, two 6 x 4 card files, and nine 5 x 3 card files. The various machines, C, D, E, F, H, I, K are standard equipment. The telephone switchboard B is a PBX board with ten practical telephones and one trunk line. The trunk line connects with the switchboard in the main office of the school and may thus complete connection with any telephone in the building.

The complete set-up represents thirteen different jobs, arranged in duplicate. The students spend three weeks in each job and then move on to the next in accordance with a prearranged plan. In general, the duties of the individual jobs are as follows:

The *class managers* (1-2) have full supervision over the class. They receive work to be typed or mimeographed; assign the work to class members; and keep records of the work done by each member. This job offers excellent opportunities for the development of initiative, powers of organization, and the ability to direct others.

The *duplicator assistants* (3-4) learn to use the duplicating machine and the Mimeoscope under the direction of the duplicator operators.

The *duplicator operators* (5-6) act as instructors to their assistants. They also study the various methods of duplication.

The *information clerks* (7-8) meet all callers at the classroom, operate the telephone switchboard, and handle the shaving of records for the dictating machines. At these desks the workers may cultivate such personality traits as courtesy, tact, alertness, and good judgment.

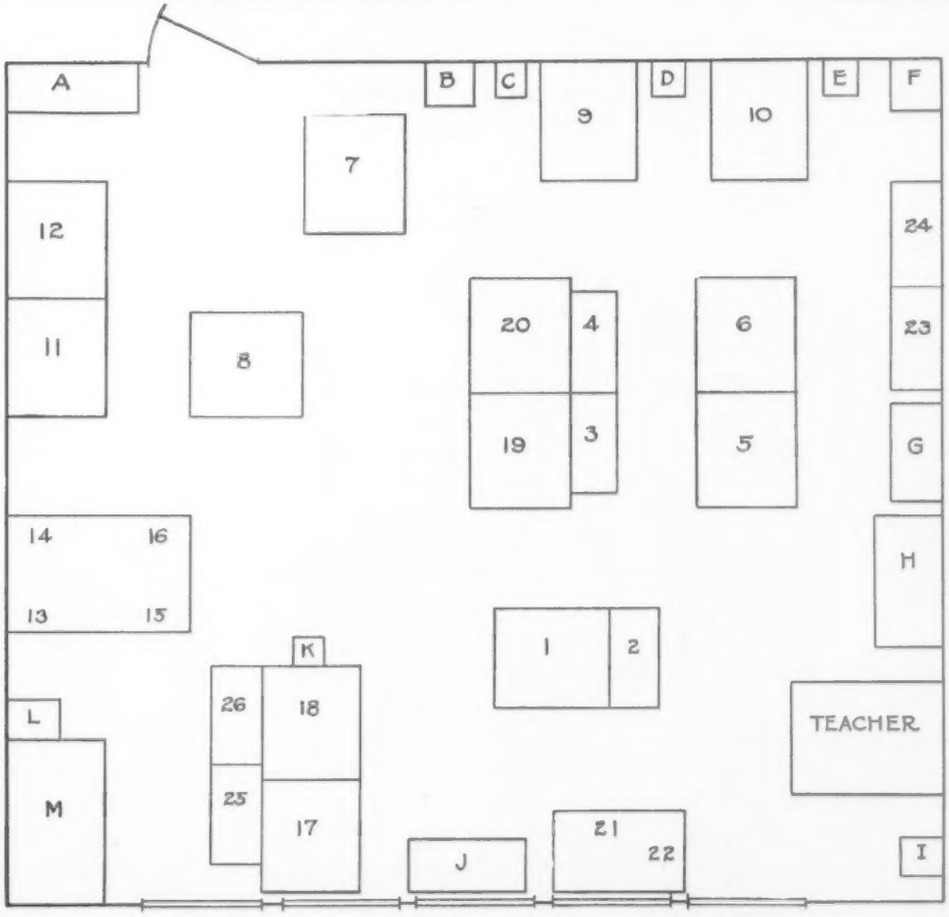
The *dictating machine operators* (9-10) learn to use the transcribing machines and also become familiar with methods of dictating to the executive machine. Permanent practice records are used to provide ideal conditions during the learning period. Before the students leave these machines, however, they must dictate and transcribe standard office records. This training is given to enable the class members to supplement their shorthand abilities with another employment skill.

Looking toward teacher's desk

Looking toward filing cabinet (M)

Looking toward Mimeoscope (F)

Looking toward supply cabinet (A)



LEGEND

1, 2. Class managers
3, 4. Duplicator assistants
5, 6. Duplicator operators
7, 8. Information clerks
9, 10. Dictating machine operators
11, 12. Supply clerks
13, 14. Incoming-mail clerks
15, 16. Outgoing-mail clerks
17, 18. File clerks
19, 20. Record clerks
21, 22. Editorial clerks
23, 24. General clerks
25, 26. Circularizing clerks

A. Supply cabinet
B. Telephone switchboard
C. Record shaving machine
D, E. Transcribing machines
F. Mimeoscope
G. Paper table
H. Duplicating machine
I. Dictating machine
J. Ventilator
K. Addressing machine
L. File sorting tray
M. Filing cabinet

The *supply clerks* (11-12) have charge of all supplies used in the class, issue these materials to the students on requisition, and keep visible card records of requisitions and "balance of stores." Our visible file, not shown in the chart, accommodates cards 8 x 5 inches in size. The forms on these cards are prepared by the duplicating machine operators.

The *incoming-mail clerks* (13-14) open incoming mail, make records of remittances received and items expected under separate cover, and learn to make digests of correspondence. Incidental equipment used at this desk consists of a mechanical letter opener and a hand-set time stamp.

The *outgoing-mail clerks* (15-16) fold, insert, seal, and stamp outgoing mail (we use facsimile stamps). They also weigh parcel post packages and determine required postage. The equipment at this desk includes a sealing sponge, parcel post scales (capacity 2½ pounds). Dummy packages are used for practice in handling package mail.

The *file clerks* (17-18) have charge of all correspondence filing in the class and learn both alphabetic and numeric filing. These students file about 1,200 letters during the time they spend at these desks.

The *record clerks* (19-20) keep vertical card records of all mimeographed work handled by the class. They file mimeographed copies in a numeric letter file. Stencils are kept in a stencil wall cabinet.

The *editorial clerks* (21-22) accept or reject transcribed letters according to quality. They also proofread stencils and other typed material intended for delivery to teachers or department. This work helps the students to develop a discriminative attitude and makes them more careful about their own typing.

The *general clerks* (23-24) act as class messengers, deliver materials to various parts of the building, fill in jobs whenever necessary, and on occasion assist teachers with clerical or stenographic work.

The *circularizing clerks* (25-26) keep our Parent-Teacher Association mailing list of 2,000 names. This work requires a complete 5 x 3 card file, a set of address stencils prepared by the clerks, and an addressing machine. About six mailings of postal-card messages are made each school year. The messages are mimeographed and the cards are addressed by the circularizing clerks.

Much of the work undertaken in our Secretarial Practice class, as may be seen, is of a practical nature; for instance, our students cut and mimeograph about 800 stencils each school year. This may appear to be student exploitation, but it really means that each student cuts about ten stencils during his course in the class and, consequently, is not overburdened with this type of work. Practical jobs of this kind, if kept under control, have the decided advantage of giving the students a real incentive for good work. We have often been asked what we should do if these practical jobs were not obtainable. Of course, we use a reasonable number of textbook problems; but we have found that any school system will furnish enough work to keep a class busy if the teacher has his eyes open for such work.

THE ADMINISTRATIVE OFFICE IN ELEMENTARY AND SECONDARY SCHOOLS

By WILLIAM C. REAVIS

Professor of Education, University of Chicago

THE administrative office in elementary- and secondary-school buildings is a product of change in the professional status of the school principal. In the early schools the principal was regarded merely as a head teacher whose administrative duties were relatively few. Most schools were therefore built without administrative offices. In case waste space was finished into closets or storage rooms, an available room was sometimes used by the principal for occasional conference and for keeping his personal belongings. But with the release of the principal from teaching duties in the rapidly growing schools in city systems, the needs for office space and facilities in carrying on administrative functions multiplied quickly.

School boards and architects gradually realized that the assumption of administrative functions by the principal required that buildings be provided with an office layout. This is shown in the city of Chicago, for example, by the average percentage of total floor space allocated in elementary schools for office purposes in three periods—1878 to 1897, 1898 to 1917, and 1918 to 1937. In the first period only 0.5 per cent of the total floor area was planned for administrative uses. This percentage was increased to 1.2 in the second period and to 1.5 in the third. The average number of rooms per building provided for office purposes in the first period was only 0.75, signifying that some schools in the period had no office space at all. In the second period an average of 3.5 rooms was provided, with an average area of 706 square feet, and in the third period 5 rooms, with an average area of 907 square feet. The allotment of space for office purposes in secondary schools was somewhat greater on account of the greater size of the buildings, although not proportionally so.

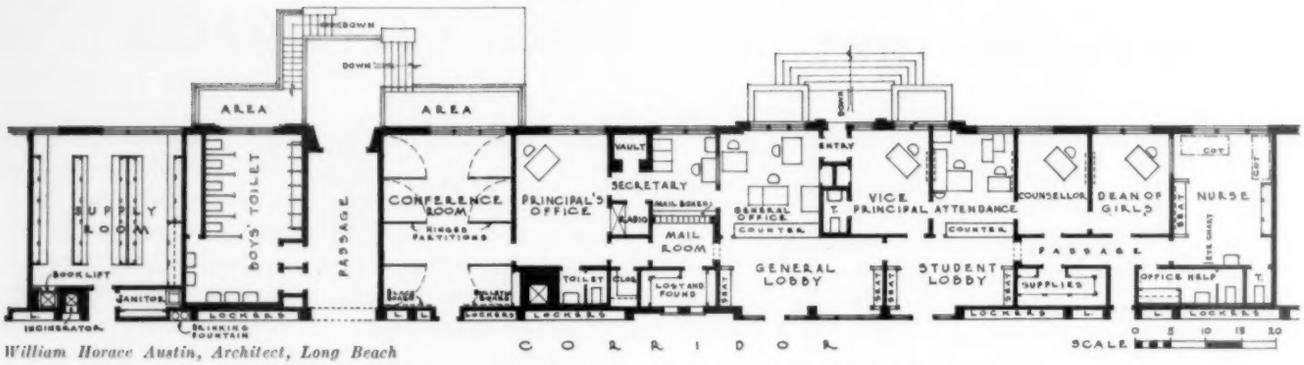
Studies of the plans of school buildings show that neither the designers nor the administrators responsible for the planning of buildings have had an adequate conception of the importance of office facilities in administration. The office suite, even in modern schools, all too frequently consists of a reception room, storage space, and general office. In some of the better-planned offices a private room is provided for the principal and a workroom for the clerk. The idea of centralizing all administrative functions in an office suite as a means of increasing administrative efficiency has not been generally recognized. In fact, the plans of modern school buildings frequently reveal evidence that the planners have provided for many of the functionaries in administration largely by the utilization of odd space.

The authors of texts in school administration have given considerable attention to the functional character of administrative offices at all levels.[1] These authors show that the single-room conception of the administrative office is no longer adequate and that efficiency in administration requires the centralization of administrative functions. The modern office in elementary or secondary schools requires (1) a general room for the reception of callers; (2) office space for a clerk or staff of clerks, separated from the public room by a counter or barrier to provide a degree of privacy for the work to be carried on; (3) a private office for the principal for conference and study; (4) fireproof storage space for important records; (5) a storage room for office supplies; (6) toilet facilities and wardrobe; (7) workroom for the housing and use of duplicating devices; (8) storeroom for pupil supplies, if free supplies are furnished to pupils; (9) office rooms for vice-principal, counselor for boys and girls, visiting teacher, physician, nurse, emergency room for pupils, and other special services under the control of the central office; and (10) conference room for teachers.

Centralization of Office Functions

If space is provided *en suite* in a central office in the larger schools for the functions and functionaries enumerated, great economies can be effected both in the amount of space required and in the services rendered. One reception room, for example, thus can serve all the office functionaries, and a single set of records can be utilized by the entire office staff. The work of the clerks can be differentiated, one serving as information secretary, another as the custodian of records, while the others serve the staff members as a group. Such an arrangement also enables the principal to keep in close contact with the activities of his assistants and to maintain general supervision over the clerical staff.

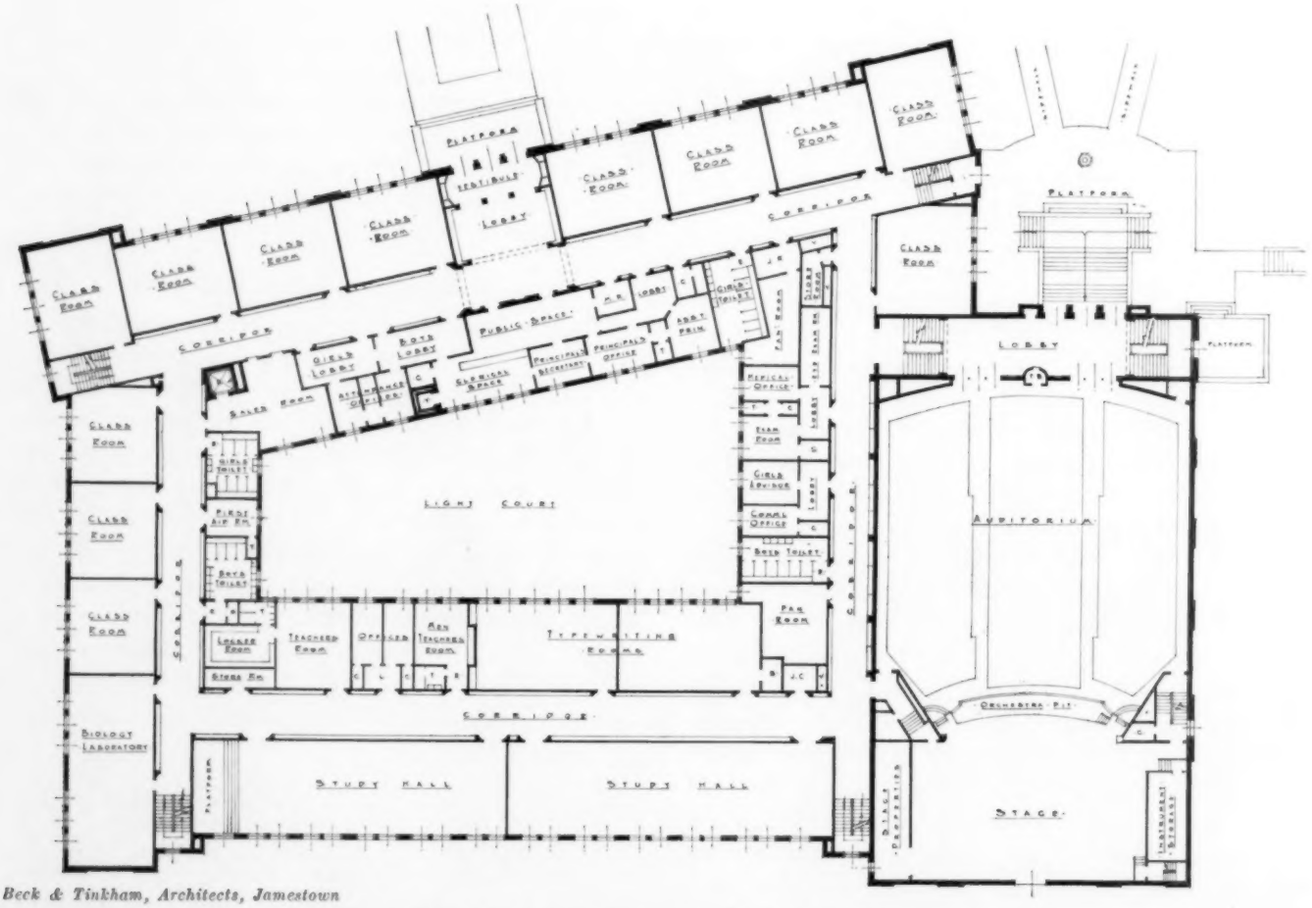
[1] For discussion of the organization of the administrative office in elementary schools, see Reavis, W. C., Pierce, P. R., and Stullken, E. H.: "The Elementary School; Its Organization and Administration," pp. 76-101. University of Chicago Press, Chicago, 1931. For the high-school office, see Douglass, Harl R.: "Organization and Administration of Secondary Schools," pp. 364-87. Ginn and Co., Chicago, 1932. For the central administrative offices in city school systems, see Engelhardt, N. L., and Engelhardt, Fred: "Public School Business Administration," pp. 110-26. Bureau of Publications, Teachers College, Columbia University, 1927.



William Horace Austin, Architect, Long Beach

Fig. 1—Office suite, Washington Junior High School, Long Beach, Calif.

The centralization of office functions in a properly equipped administrative suite makes for speed in the transaction of school business, eliminates waste in the duplication of records and clerical service, facilitates cooperation among administrative functionaries, and increases generally the administrative efficiency of the entire staff. Little imagination is required to see the advantages of centralization as illustrated in the office layout of the Washington Junior High School in Long Beach, California (Fig. 1), or the Jamestown High School, Jamestown, New York (Fig. 2), in contrast with decentralized layouts in the schools of the past in which administrative functionaries were housed wherever space was available.



Beck & Tinkham, Architects, Jamestown

Fig. 2—Main floor, Jamestown High School, Jamestown, N. Y.

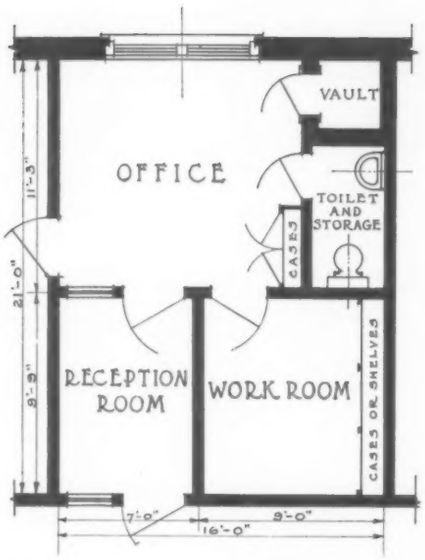


Fig. 3—Office layout recommended for elementary schools

Advanced Conception of Office Administration

An advanced conception of office administration in both elementary and secondary schools is to be found in plans published by the State Department of Education in Missouri.[2] (See Figs. 3 and 4.) To this Department the office was first of all a contact room between the school and the outside world. This is evidenced by provisions for a waiting or reception room for callers. Second, the office was recognized as a private place for the principal where he could receive visitors privately or engage in study. Third, the office was conceived as a place for storing records and reports as well as other materials essential to the operation of the school. Fourth, the office was planned as a place for work where the principal, clerk or teachers can be supplied with the equipment needed in the preparation of materials for administrative or instructional use. In the case of the high school, the counter is used to separate the waiting room and the office of the secretary. The counter is utilized as a filing space for forms and records, and the waiting room as the clearing-house of the school. The waiting room contains a master clock, a bulletin board and mail-boxes for teachers, a public telephone, and seats for callers.

An examination of the available published plans of modern school buildings, drawn for school systems throughout the country, shows that the conceptions of office layouts just discussed are in advance of those in use in the large majority of towns and cities. All too frequently an outmoded conception of office functions seems to prevail. Whether the responsibility for this conception is chargeable to the superintendents of schools, to the designing architects, or to economic factors, is difficult to determine. At least, the conventional types of office layouts in use in many school systems are open to serious criticism with respect both to adequacy and to architectural plan.

Personnel Organization

A modern office layout of the centralized type is an important step in the direction of efficient school administration, but it does not necessarily insure administrative efficiency. The functionaries who engage in administrative work must be properly organized and their activities coordinated, if facilities are to be

[2] "Schoolhouse Planning and Construction."—School Building Series, Bulletin No. 2. Jefferson City, Mo.: State Department of Education, 1933.

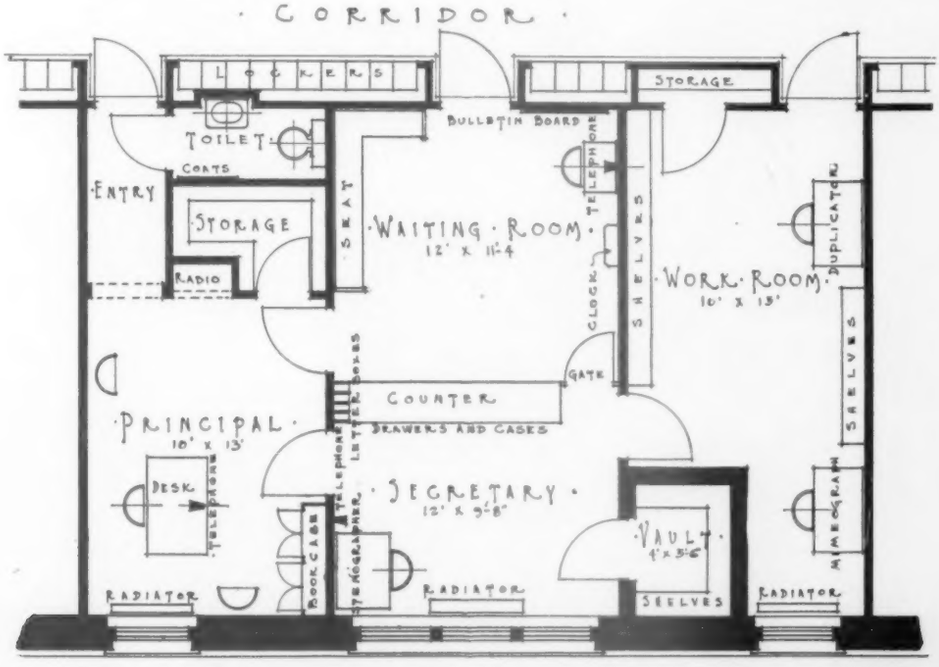


Fig. 4—Office layout recommended for high schools enrolling 200 to 700 pupils

Plans on this page reproduced through the courtesy of the School Building Division, Missouri State Department of Education

wisely used. This means that the functions of administration in a given school must be clearly conceived by the school head, that the responsibilities of the personnel must be defined, and that the relationships between functionaries must be understood. To the realization of the results desired, the modern administrative office and its facilities can make an important contribution to school efficiency, but the office and its organization must never be made an end. Generally speaking, a well-conceived office should signify a well-administered school, but unless the organization set-up results in the emancipation of the principal from routine administration and petty details, and the use of his time for responsibilities of major concern to his school, the administrative office fails in its essential purposes, regardless of what the layout or equipment may be.

School Office Equipment

The modern school office also requires modern equipment. Machines that will save the time and labor of assistants and mechanical devices designed to facilitate administration should be employed whenever practicable and possible. Such equipment is as essential to efficient administration as is properly planned office space. Its use results in the saving of time, in relieving the personnel of worry caused by petty details, and in obviating the necessity of relying on "hunches" and guesses instead of facts.[3]

In planning a centralized office layout consideration should be given to the mechanical equipment to be installed in order to avoid future expense in providing electrical outlets and storage space. While it is now very generally known what the standard office equipment should be, new inventions of the labor-saving type may require changes in the office layout unless the functional uses of the space are foreseen in the original plans. The following table[4] shows the frequency of use of various items of equipment in a sampling of 522 offices in widely scattered secondary schools ranging in enrolment from 4 to 6,500 pupils.

TABLE I

NUMBER AND PERCENTAGE OF LABOR-SAVING DEVICES USED IN 522 ADMINISTRATIVE OFFICES

Device	Number	Per Cent
1. Typewriter	512	98.1
2. Filing cabinet	499	95.6
3. Telephone	492	94.3
4. Stencil duplicator	478	91.6
5. Desk calendar	452	86.6
6. Program clock	448	85.8
7. Hand stamp	394	75.5
8. Adding machine	372	71.3
9. Stapling machine	321	61.5
10. Numbering machine	201	38.5
11. Memorandum tickler	186	35.6
12. Visible file	165	31.6
13. Gelatin and liquid duplicators	136	26.1
14. Mimeoscope	109	20.9
15. Neostyle	104	19.9
16. Multigraph	100	19.2
17. Efficiency desk	93	17.8
18. Comptometer	92	17.6
19. Work organizer	89	17.0
20. Cash register	69	13.2
21. Dictating machine	42	8.0
22. Bookkeeping machine	29	5.6
23. Addressing machine	20	3.8
24. Stenotype	11	2.1
25. Card-sorting machine	6	1.1
26. Mailometer	3	0.6
Total	5,423	10.4 *

* Average number of labor-saving devices per office.

3 For list of labor-saving devices in office organization and administration, see Reavis, W. C., and Woellner, R. C.: "Office Practices in Secondary Schools," pp. 63-99. Laidlaw Brothers, Chicago, 1930.

4 Reavis, W. C., Pierce, P. R., and Stullken, E. H.: "The Elementary School, Its Organization and Administration," p. 92. University of Chicago Press, 1931.

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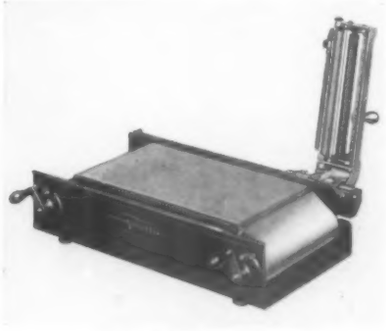
For 30 years, L C Smith has been an outstanding name in the **office typewriter** field—for sound design, honest construction, and long-lived efficiency. For almost a like period, Corona has been the foremost name in **portable** typewriters. Their combined experience and good name stand behind every L C Smith & Corona product.



Vivid Junior

Vivid Duplicator

Reproduces everything that can be drawn with pen or pencil or typed—in up to eight colors — for a cost of only a few cents per 100 copies. Invaluable for seat work tests, assignments and many types of projects; saves endless dictating and copying time. Vivid Rolls, for all types of gelatine duplicators, give exceptionally bright and uniform results.

Corona Adding Machine

Low price, convenient portable size. All standard features including All-Visible keyboard; automatic ciphers; automatic signals; all feature keys; large, legible printing properly punctuated; large capacity. For school or office.

Corona Adding Machine

Type-Bar Brand Ribbons, Carbons, and Supplies

Excellent quality de luxe and standard grades, for every typewriter requirement. Ribbons are evenly inked, lightly or heavily as desired. Carbon papers are carefully graded for uniformity.

The Super-Speed Standard L C Smith Office Typewriter

The famous ball bearing typewriter noted for its ease and speed of operation—long the favorite of court reporters and other typists who require the utmost in dependability. Floating shift, right or left hand carriage return, micro touch selector, etc. A wide variety of carriage widths, type faces and special keyboards to order.

The Super-Speed Silent L C Smith Office Typewriter

This is the pioneer Silent machine of STANDARD design—hence may be operated at the same high speed and efficiency of the standard typewriter. Machine noises virtually eliminated; impact noise substantially reduced. Popular for secretarial work—reduces nerve strain and operating fatigue to a minimum. Smith floating shift, ball bearing type bars, interchangeable platens, micro touch selector and many other new features.

Corona Portable Typewriters

Corona is the pioneer portable typewriter. Several models at prices to suit every purse. Four rows of keys, standard keyboard arrangement, floating shift, piano key action, touch selector, etc. Complete with carrying case and typing instruction chart. Easy payments if desired.

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NEW UNDERWOOD MASTER TYPEWRITER, quiet in operation, with completely sealed back and sides. 1-key keyset Tabulator and Dual Touch Tuning, Champion Keyboard.

UNDERWOOD UNIVERSAL PORTABLE TYPEWRITER, four-bank Champion Standard Keyboard. Completely enclosed back. Touch Tuning. With or without carrying case.

UNDERWOOD JUNIOR PORTABLE TYPEWRITER. Upper and Lower Case Type. Pica Type—10 Pitch only. Black enamel finish only. With or without carrying case.

UNDERWOOD STANDARD TYPEWRITER, with 1-key keyset Tabulator, individual Key Lever Tension, Champion Keyboard: Available in 11″, 12″, 14″, 18″, 20″ and 26″ Carriages.

UNDERWOOD CHAMPION PORTABLE TYPEWRITER, semiquiet; four-bank Champion Standard Keyboard, inbuilt 1-key Tabulator. Touch Tuning. Completely enclosed back. With or without carrying case.

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UNDERWOOD 77 NOISELESS PORTABLE TYPEWRITER, noiseless in operation, with 1-key Inbuilt Tabulator, completely visible, Pressure Stroke.

UNDERWOOD NOISELESS PORTABLE TYPEWRITER, noiseless in operation, completely visible, Pressure Stroke. With or without carrying case.

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Watch any Underwood Sundstrand operator as she taps out figures 15% to 25% faster. Her eyes follow the work. Only the fingers of her right hand are on the condensed 10 key keyboard. No multiplicity of keys to make busy fingers grope. No complex mechanism to cause constant head-swinging between work and machine. There's not an unnecessary key on the entire Underwood Sundstrand keyboard. Write or telephone for full information today.

UNDERWOOD SUNDSTRAND HAND OPERATED MODELS. Only 10 Numeral Keys, One Hand Operation, Automatic Sub-Totals, Visible Printing, Two Color Ribbon. For Addition, Subtraction, Multiplication and Division. Wide or Narrow Carriages. Direct Subtraction and Credit Balances optional. Various Column Capacities.

UNDERWOOD SUNDSTRAND PORTABLE ELECTRIC MODELS. Only 10 Numeral Keys . . . arranged naturally for Touch Operation. Three Point Control of: Addition, Subtraction, Multiplication, Division, Non-Addition, Totaling and Sub-Totaling, through electrified Control Keys. Basic hand machine features included. Various Column Capacities.

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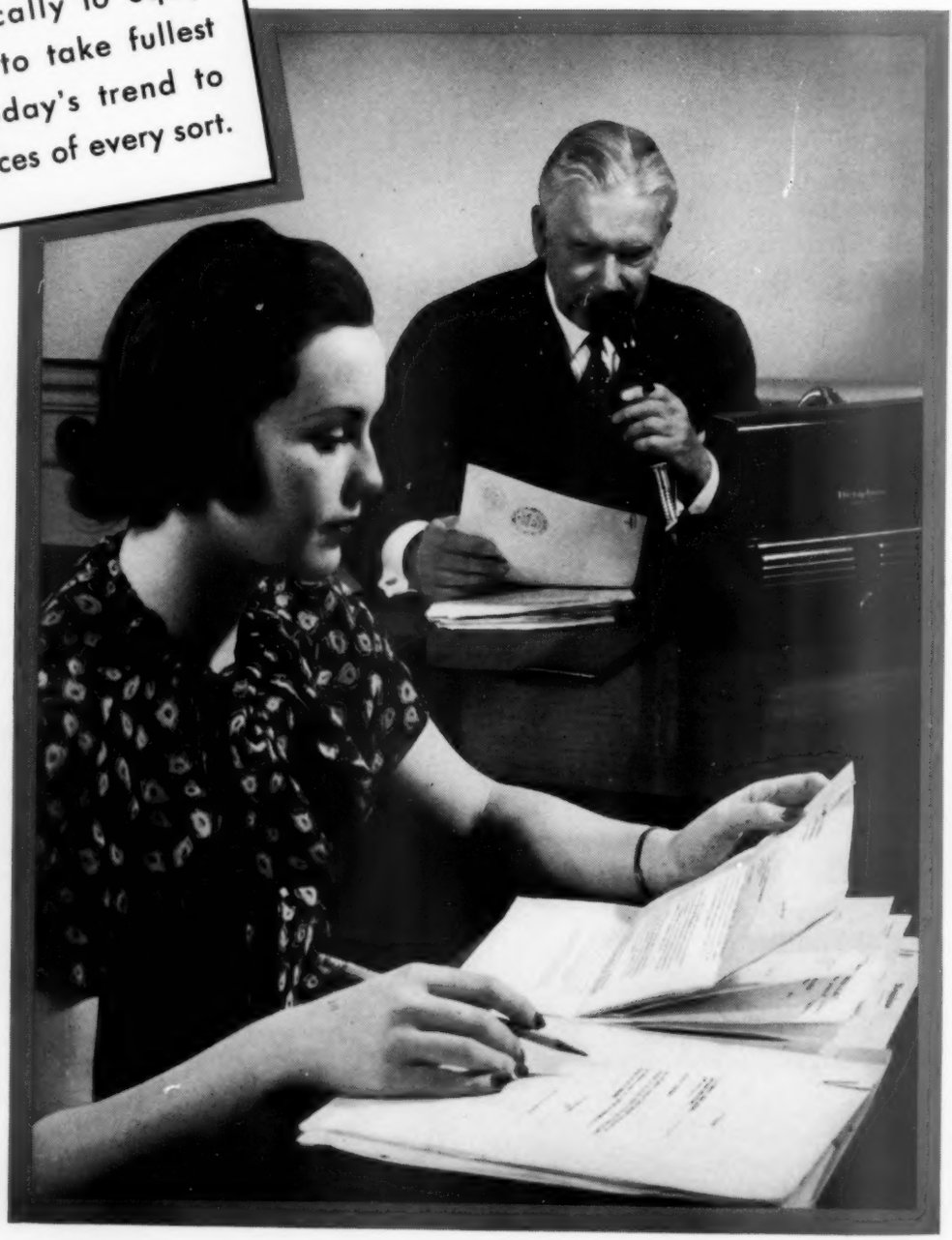
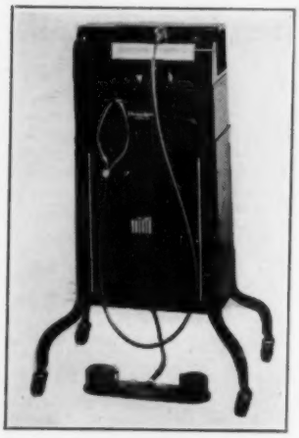
3 modern courses of

Designed specifically to equip today's students to take fullest advantage of today's trend to Dictaphone in offices of every sort.



New B-12 Dictaphone Transcribing Machine. Used in connection with the three courses described here. "Nuphonic Reproduction" gives amazing voice clarity



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By Ivy Monk, Drexel Institute, consists of textbook and 18 practice records. The equivalent of 50 hours actual office experience. Trains the graduate to "find herself" quickly on her first job. Instills confidence—an invaluable asset to any graduate beginning her business career! Employers give preference today to applicants who have been awarded the Dictaphone Certificate of Proficiency.

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A highly effective method of teaching *speed* and *accuracy* in typewriting. Consists of a textbook and 40 practical records. With the aid of this material a 4-semester typewriting course can be covered thoroughly in 3 semesters—a clear saving of 33⅓% in time alone. Furthermore, with classroom noises eliminated, students concentrate more easily, absorb instructions faster. Another advantage: it enables "retarded" students to practice typewriting after hours when no teacher is present.

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By Dr. Letitia Raubicheck, Director of Speech Education, New York City Board of Education, and Mary Morris Seals, Instructor in English, Barnard College, Columbia University. A better way to teach oral English! The student READS the exercises in the textbook at the same time he HEARS them spoken on Dictaphone records. He practices each exercise aloud, and then SPEAKS it into the Dictaphone mouthpiece. He then compares his own recording with the faultless pronunciation of Dr. Raubicheck on the master record. This course readily adapted to classroom work. Cost per student is small.

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420 Lexington Avenue **New York City**

THE EDIPHONE—THOMAS A. EDISON, INC.

Laboratory and General Offices: West Orange, N. J.

Hired 153 Girls

Miss Helen A. Taylor, in her twelve-year career with the Association of National Advertisers and at Federal Advertising Agency, has personally employed 153 office workers. She insists that graduates have a good knowledge of shorthand...but admittedly is prejudiced in favor of girls who have also had voice writing experience...

Prefers those trained in voice writing

You can't blame employers for selecting the graduates whose training is more complete. New employes are expected to be good typists and to know shorthand . . . but business-machine training is an added "plus" which often makes the difference between getting the job and not getting it.

The point is that voice writing with the Ediphone is gaining ground rapidly in all kinds of business. It's the *modern* way of handling correspondence, memoranda, instructions and detail. It's something a student should learn in school—and not have to apologize for having missed when the job-hunt starts.

Teach voice writing for a *completed* business education. Get data (without obligation) from the Department of Educational Training, Ediphone Division, Thomas A. Edison, Inc., West Orange, N. J.

—PREFERENCE FOR EDIPHONE PERSISTS—

What voice writing does for the modern executive

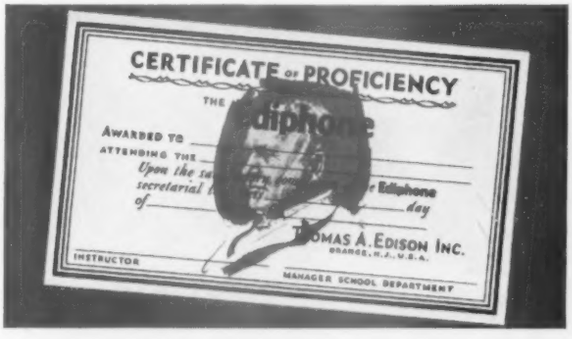
It's only natural that each year should see many more executives employing secretaries trained in voice writing. Voice writing gives an executive time for clear thinking. It clears his mind of details, correspondence and memos. The Ediphone records his thoughts and ideas immediately—while they are fresh in mind.

Why graduates trained in voice writing are more valuable

Voice writing enables a stenographer to become a helpful assistant. Instead of sitting around waiting for the boss to get through his dictation she keeps busy at more important work. The secretary or stenographer can plan ahead for the day and schedule her time without fear of frequent interruptions. She is able to do her typing direct, following more accurately the directions of her employer.

The Ediphone secretarial course

Give the students of your school the opportunity to capitalize on the trend to Ediphone voice writing. A knowledge of this most modern business machine is invaluable. There are many thousands of stenographic positions today which require a knowledge of voice writing. The Ediphone Secretarial Course is a complete, planned system of instruction. Based on the supervised study method, it requires very little of the teacher's time.



● This certificate of proficiency signifies a thorough knowledge of the Ediphone and voice writing. Often it very materially aids the holder obtain employment.

Write for full information

Department of Educational Training
Ediphone Division,
Thomas A. Edison, Inc.
West Orange, N. J.

TEACH VOICE WRITING WITH THE

Ediphone
EDISON VOICEWRITER

DITTO, *Incorporated*

World's Largest Manufacturers of Gelatine and Liquid Duplicators

2265 W. Harrison Street, Chicago, Ill.

For Gelatine or Liquid Process Duplicators—

LOOK TO DITTO

For years Ditto, Incorporated, has been the world's largest manufacturer of gelatine duplicating machines and supplies. Always its aim has been to manufacture and sell equipment that will do the job which you have to do at the lowest possible cost.

Today, Ditto manufactures and sells both **Gelatine** and **Liquid** type duplicators—providing a complete selection for every school use at prices ranging from $3.95 up. You can make no better selection anywhere than from the complete line of Ditto School Duplicators.

An important fact to remember is that there are advantages to both **Liquid** and **Gelatine** type duplicators. Because Ditto manufactures and sells both types of machines, Ditto representatives are in a position to make intelligent, unbiased recommendations as to the machine that will serve your purpose best.

The Gelatine Duplicator is famous for its flexibility. It copies one or all of eight colors in one operation direct from your pencil, pen and ink, typewriter or printed original; it needs no stencil, carbon or type. One original will produce 100 copies.

The Ditto Direct Process (liquid) Duplicator supplements and extends the Ditto process in two important respects:

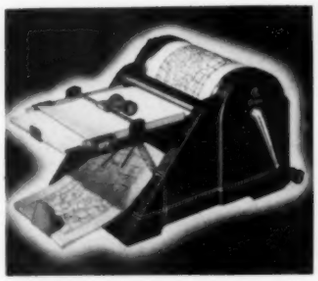
(1) It extends the Ditto copy range from 100 to 200 copies, still maintaining the low operating cost so typical of all Ditto equipment.

(2) It makes possible the repeated use of an original to make additional copies of the information as needed. The copies are made by direct offset from the original.

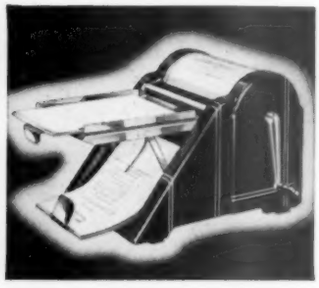
Any elementary grade child can operate Ditto. That's why it has been such a favorite with teachers: that's why you will find in thousands of schools today that all duplicating work is done by Ditto.

Write today for a free demonstration of either a Ditto Gelatine or Liquid Duplicator, or more detailed information about either type of duplicating method.

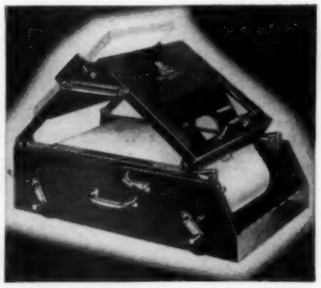
GELATINE DUPLICATORS



The Ditto R-4 Rotary — A self-feeding, self-ejecting gelatine process machine, which sets a new standard for efficient, economical operation. Operates at a speed of 70 copies per minute. Copying surface—8½ x 14″



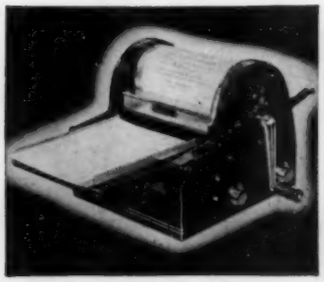
Hand Fed Rotary—A hand fed, self-ejecting duplicator that is simple to operate. Strong, lightweight, foolproof. Makes 50 or more copies per minute. Highly efficient—low in cost. Size 8½ x 14″



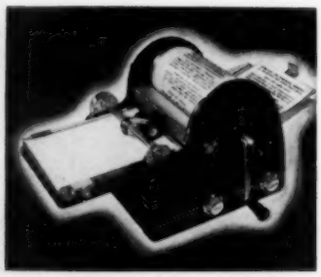
Portable — Low priced, hand operated, compact and flexible. Easily portable—low in initial cost and low in operating cost. Size 8½ x 13″

Film-o-graph—A teacher's duplicator. Replaces old-fashioned hectograph. Films are used over and over again. Size 8½ x 14″

LIQUID PROCESS DUPLICATORS



The Ditto D5—A sturdy, compact, hand fed duplicator. A table model liquid duplicator designed for school use. Contains many outstanding engineering features. Size 9 x 13¾″



The Ditto D-6 — A speedy liquid process rotary. Self-feeding and self-ejecting. Produces 70 or more copies per minute. Masters may be reused over and over. Copying surface—8½ x 14″

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DIRECT BRANCH SERVICE EVERYWHERE
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"The Miller Line
Is Superfine
For Every Typing Need.
For Cleanliness,
For Permanence,
Economy and Speed."
—CARBON KID.

Made in a complete variety of weights and finishes, in all standard colors and sizes, for any purpose where a carbon paper may be utilized:

ADDING MACHINE ROLLS—PLAIN OR CARBON ROLLS CARBONIZED
COPYING CARBON PAPER
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Made regularly in all standard colors and standard color combinations, record or copying, and in seven different degrees of inking, for any machine requiring an inked ribbon:

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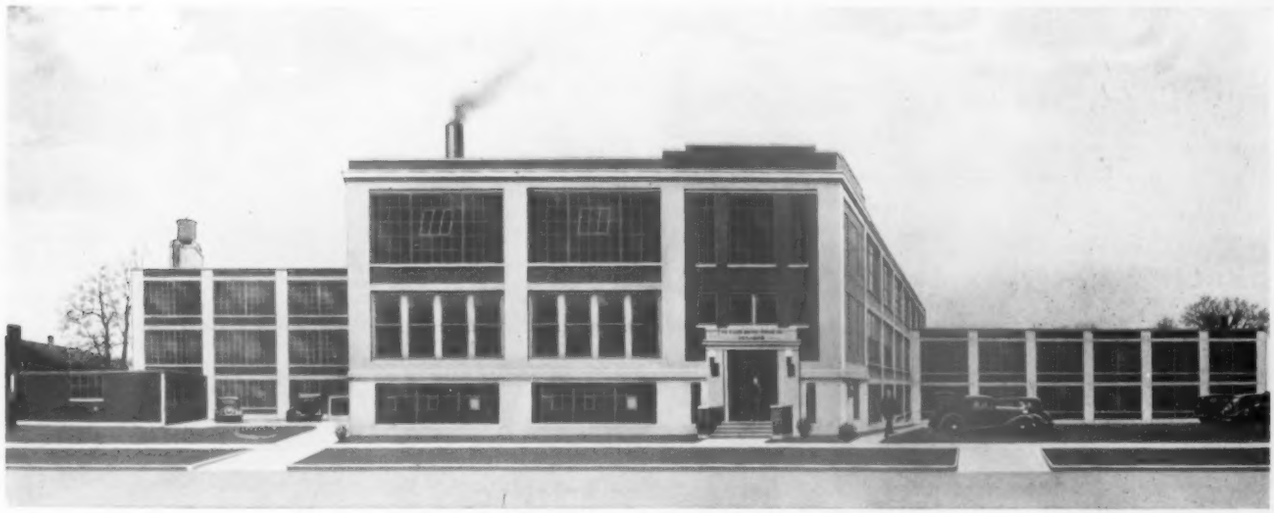
MILLER LINE STENCIL INKS FOR ROTARY DUPLICATING MACHINES

Open Drum, Closed Drum, Fountain Feed, Portable

Prompt and Careful Attention given to special or unusual Requirements by our Research and Development Departments

WRITE FOR ADDRESS AND TELEPHONE NUMBER OF YOUR MILLER LINE SERVICE CENTER

"The Miller Line
Withstands Comparison."
—INKY KINKY.



Back of Miller Line Perfection Stands this Modern Plant

THE GREGG PUBLISHING COMPANY

New York Chicago San Francisco Boston Toronto London Sydney

A Complete Office Practice Program

Practical Instructional Materials For Every Teaching Plan

For the Rotation Plan

OFFICE APPLIANCE EXERCISES, by J. T. A. Ely and A. C. Beaver

Revised November 1, 1935. The purpose of this brief course is to familiarize the students with the most commonly used office machines which, from the teaching standpoint, may be divided into four groups: (1) accounting and record-keeping machines, (2) duplicating machines, (3) name- and data-writing machines, (4) miscellaneous labor-saving machines.

The teaching plan of this beginning text is simple and is based on the apprentice system of instruction. One pupil at a time receives instruction on each type of office machine. He, in turn, "breaks in" the next pupil before passing on to another machine. This plan of instruction follows the customary procedure in the business office—the expert operator "breaking in" the new operator. List price of text, $1.60.

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OFFICE MACHINE PRACTICE, by Dr. C. H. Katenkamp

A series of five booklets designed to teach fundamental operation technique. A separate book for each machine. Largely self-instructing. The booklets include: No. 1, The Monroe Calculating Machine; No. 2, The Burroughs Calculator; No. 3, The Sundstrand Adding and Listing Machine; No. 4, The Dalton Adding Machine; No. 5, The Comptometer. List price of each booklet, 32¢.

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Adapted for use with any type of calculating or adding machine—either listing or non-listing. Twenty lessons, frequent tests, and plenty of supplementary work. List price of text, 60¢; package of checks, 36¢.

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The nearest approach to actual office procedure, and the most authoritative business practice course yet published for this plan of instruction.

This course presupposes a general knowledge of the functions of a business office and a reasonable amount of proficiency in the performance of various office skills. "Office Practice" calls for the functioning of these knowledges and skills in their natural relationship.

A finishing course for secondary school students, adapted to any and all types of office machines. May be used with or without equipment. Text in two parts. List price of each part, 80¢.

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A comprehensive course for beginners. The office-manual approach and treatment for learning secretarial practice. This is the method usually followed by large offices in teaching new employees. The Laboratory Materials, projects taken from business offices, present an attractive integration of the various duties of the office. This course represents a minimum of theory and a maximum of office experience. Used by thousands of schools—of all types—as the text for secretarial practice classes. List price of text, $1.40; Laboratory Materials, 60¢.

Write our nearest office for sample copies.

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THE AMERICAN SCHOOL AND UNIVERSITY

ALL-STEEL-EQUIP COMPANY, INC.

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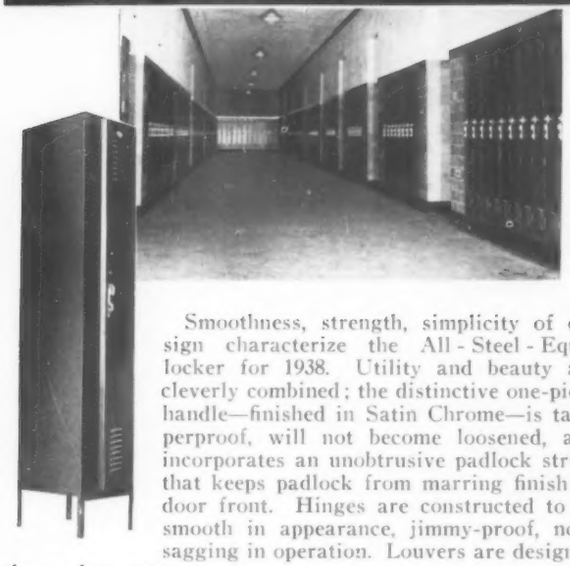
WRITE FOR LATEST CATALOG OF SCHOOL EQUIPMENT

A-S-E MODERN LOCKERS



Smoothness, strength, simplicity of design characterize the All-Steel-Equip locker for 1938. Utility and beauty are cleverly combined; the distinctive one-piece handle—finished in Satin Chrome—is tamperproof, will not become loosened, and incorporates an unobtrusive padlock strike that keeps padlock from marring finish of door front. Hinges are constructed to be smooth in appearance, jimmy-proof, non-sagging in operation. Louvers are designed in the modern manner.

A-S-E lockers are ruggedly built to provide years of service.

Finished in Olive Green baked-on enamel, French Gray, School Furniture Brown. Other colors to order.

Send for Catalog No. C-30 for more information.

TEACHER-CONTROL A-S-E WALL-ROBES

For the first time All-Steel-Equip Company announces a new clothing storage system for elementary schools, a battery of steel Wall-Robes with one point lock control but with individual door operation. Each single unit in the battery can accommodate as many as six pupils; Wall-Robes may be recessed in walls of new buildings or set up, free standing, in remodeled buildings. Tremendous saving in space can be effected by their use.

Handles, hinges and louvers are the same design as those on A-S-E locker and finishes are the same. Write for Bulletin No. WR-1.

A-S-E PATRICIAN SHELVING

Steel shelving that combines the beauty of wood with the strength and durability of steel. 36″ wide sections may be used as single units or in batteries. Easily erected, easily moved.

A-S-E STEEL CABINETS

A line of fifty-seven models of strong steel cabinets with single or double doors, adjustable shelves, grooved key disc tumbler lock, smart vault type hardware, offers a unit for any particular school need. Standard finish is Olive Green, but Walnut, Mahogany, grained Oak or French Gray may be furnished upon specification. Ask for Catalog No. 175.

BEHIND THE A-S-E TRADE-MARK

There is over a quarter of a century of experience in the design and manufacture of A-S-E steel lockers, steel book shelving, steel storage, filing, card, wardrobe cabinets, steel transfer cases, steel typewriter stands and steel shop equipment. High quality is maintained and complete satisfaction is assured.

A-S-E maintains a staff of experienced engineers whose services are available, without obligation, for consulting and designing. Their suggestions have been especially valuable in connection with the choice of the proper type of locker to meet each requirement and in suggesting the most practical solution to the placement problem. Branch offices provide prompt and accurate supervision.

REMINGTON RAND INC.

Buffalo, N. Y.

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AND ALL OTHER PRINCIPAL CITIES

CERTIFIED RECORD PROTECTION EQUIPMENT

SAFE-CABINETS

Scientific research and tests conducted by the Safe Manufacturers National Association definitely proved that, in most cases, safes built prior to 1917 are obsolete, and as such, cannot afford adequate protection to papers against fire. Remington Rand SAFE-CABINETS comply fully with the rigid standards set by the National Fire Protection Association, the Underwriters Laboratories, the Safe Manufacturers National Association, and also the federal specifications of the U. S. Bureau of Standards. SAFE-CABINETS can be had for 4 hr., 2 hr., and 1 hr. protection against fire. Obtainable in many sizes with a wide variety of interior fittings. May be equipped with slide-in doors.

SAFE-FILES

To give filed papers the protection equal to that of a safe is the purpose of the Remington Rand SAFE-FILE. An all one-piece insulation supplemented by heavily insulated tongued, grooved and gasketed drawerheads offsets violent attacks by fire. The rigid, strongly-built suspension prevents any sagging of the drawer even when fully extended and loaded to capacity. It easily carries loads ranging from fifty to seventy-five pounds exclusive of drawerweight.

SAFE-FILE inserts are of two types—drawers and removable trays. Both types can be used in both Letter and Legal size SAFE-FILES. Takes 5 x 3, 6 x 4, and 8 x 5 Card Tray Inserts. Available in 2, 3 or 4 drawers, Letter or Legal size. All units have a net capacity of 25⅛ in. Bear Safe Manufacturers National Association label.

SAFE-LEDGER TRAYS

New 2 hour SAFE-LEDGER TRAY and new, improved 1 hour SAFE-LEDGER TRAY bring certified protection against fire to records at point of operation. New 2 hour Tray is capable of withstanding torrid heat reaching 1850 degrees Fahrenheit without damage to papers. All sides thoroughly insulated. Overlapping drawerhead. Portable. Self-locking lock. Removable inner tray automatically rises with cover. Three filing depths: 15⅜", 18", and 18⅜", all adjustable to four different heights. Each model accommodates any sheet width up to 21". Both models bear Safe Manufacturers National Association label. Available in either sitting or standing heights.

VAULT DOORS

Remington Rand VAULT DOORS possess the same superior construction features which are standard on modern SAFE-CABINETS. Insulation, tongues, grooves and gaskets are alike. All doors are designed for installation in vaults having a minimum wall thickness of 10 inches and are of the raised sill type with continuous tongues and grooving on **all four** sides. Highly insulated and rigidly braced, these doors offer safe, dependable resistance to heat conduction, buckling and warping. Available with Safe Manufacturers National Association label for 6 hours, 4 hours and 2 hours. The 6 hour and 4 hour doors bear the Underwriters Laboratories label.

REMINGTON RAND RECORD PROTECTION PRODUCTS

SAFE-CABINETS
SAFE-KARDEX
INSULATED CARD FILES
SAFE-LEDGER DESKS
SAFE-LEDGER TRAYS
DRAWER SAFES
SAFE-FILES
CERTI-FILES
INSULATED VAULT DOORS

Battery of SAFE-FILES housing important papers in the Administrative office of Leland Stanford University

"LIBRARY BUREAU" LIBRARY EQUIPMENT

BOOK SHELVING

For more than a quarter of a century Library Bureau unit wood book shelving has given continuous and satisfactory service. Shelving, either five or seven shelves in height, 3′ wide on centers, allows for a wide interchangeability of shelves. Shelves are three depths: 8″, 10″, and 12″, and adjustable in height. As wood shelving can be furnished to match the trim of the room, it is generally preferred. Steel bookstacks can be furnished when desired.

LIBRARY TABLES

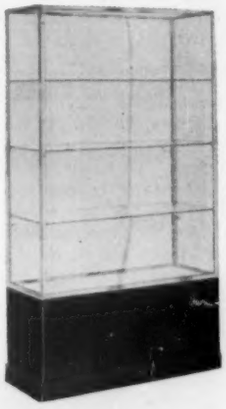
The beauty of a Library Bureau table is in the selection of wood, the finish, and the graceful proportions. Tops are built up of five-ply construction with a special process that insures against cracking, warping, or splitting. All edges are rounded to prevent slivering or splintering. Special sizes or designs are made to order.

CATALOG CASES

Whether the need be for a single case or a whole battery of units, Library Bureau Catalog Cases are the most satisfactory, because of their compactness and ease of operation. Trays are extremely rigid and strong without excessive weight for handling. Accuracy of construction provides for interchangeability of trays. All trays are equipped with positive followers, and with rods. A typical example is the model No. 23360-R shown above. Unit card catalog cases in five, ten, and 15-tray sections allow for expansion and still maintain the appearance of a single cabinet.

CHARGING DESK

A charging desk scientifically planned and well constructed affords permanent satisfaction. Library Bureau desks in either counter or sitting height are all designed to house the materials used in charging and discharging with proper arrangement to provide maximum convenience for both patron and attendant. Special desks for unusual requirements are made to order.



ADJUSTABLE MAGAZINE RACK

A magazine rack that is different, providing a new method of housing magazines alphabetically in an orderly manner—easy to find—easy to replace. It accommodates 35 magazines. Label holder at the top of each holder identifies the magazine and insures proper replacement.

REMINGTON RAND TROPHY CASES

The Remington Rand Trophy Case can be had in either aluminum or bronze. Narrow frames provide a maximum display space, yet do not detract from the beauty of the surroundings. Cases may be provided with light fixtures to afford proper illumination of contents. The typical case illustrated has glass on ends, top, front and has adjustable plate glass shelves. The front is hinged to allow for access.

Standard Library equipment is carried in stock in quarter-sawed white oak. Equipment of other woods or of special designs may be furnished on request. For more detailed information in regard to construction or dimensions, send for catalog.

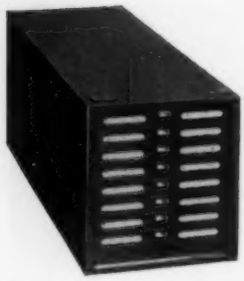
Full sweep of complete Remington Rand Library Equipment servicing the library of Brooklyn Technical High School, Brooklyn, N. Y.

REMINGTON RAND INC. ADDITIONAL LIBRARY EQUIPMENT AND SUPPLIES

- Steel Book Shelves
- Section Label Holders
- Unit Shelving Combinations
- Book Cases
- Office Desks
- Round Library Tables
- Sloping Top Tables
- Library Chairs
- Card Catalog Cabinets
- Information Files
- Newspaper Racks
- Dictionary Stands
- Bulletin Boards
- Book Trucks
- Waste Baskets
- Exhibition Equipment
- Wardrobe and Supply Cabinets
- Overdue Postcards
- Non-Loseable Book Supports
- Poster Holders
- Date Slips
- School Signature Record
- L. B. Paste
- X-L Lock Binders
- New Thrift Pockets
- Accession Books
- Application Cards
- Charging Trays
- Charging System Guides
- Periodical Record Cards
- Vertical and Visible Filing Supplies
- Mending Tools and Materials
- Rubber Dates

ADMINISTRATIVE SYSTEMS AND EQUIPMENT

KARDEX CABINETS



Kardex Cabinets are available in many card capacities. Each Cabinet is a unit in itself but can be built up with other units to form a perfect, uniform battery. All standard card sizes. Sliding trays operate easily, and may be removed when desired. Pockets can maintain two or more related forms. Thus, many combinations can be worked out for folding or overriding cards. Lock, controlling sliding trays, is optional. Cabinets may be had in olive green, walnut, mahogany, or Krinkle black finishes. Durably built for long and satisfactory service.

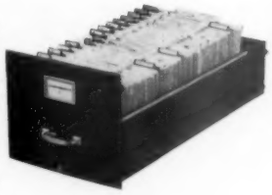
BUDGET CONTROL CARD

Here is a card that can be used to excellent advantage by Board of Education Officials, School Superintendents, Principals, and Department Heads. Available in standard sizes, card fits pockets of Kardex Cabinet slides and Zipper Book Units. Buff color denotes ordinary accounts; salmon color is used for totaling amounts in each group. Colored progressive signal flashes amounts and percentages of budget expenditures, including the month up to which appropriations have been used. Card is double-faced with last year's record recorded on back for comparison with this year's record which is kept on the front. Thus, a closer check may be kept on the present year's expenditures, month for month, with those of the previous year.

"NORMANDIE" DESKS

"NORMANDIE" 3000 Line-Steel Desks provide all the advantages of steel equipment at no extra cost. Beautifully designed and durably built, these desks will give long and satisfactory service. Top is single-sheet, 18 gauge steel, heavily reinforced. Stainless steel bindings protect the beveled edges of linoleum covering. Sides and backs of pedestals are formed from one sheet of metal. Interior framework and bracings are welded. Rigid steel legs correctly proportioned. Drawers operate silently on new suspension principle. All drawers are controlled by center drawer which has grooved lock. Available in all standard sizes and finishes.

VARIADEX



Variadex is unique in that it brings greater speed, flexibility, and efficiency to filing. It may be synchronized with the flow of papers, expanding or decreasing with no loss of efficiency.

Variadex sets are available in many alphabetical subdivisions, ranging from 25 letters to one that divides the alphabet into 10,000 units.

Another feature of this system is the use of color as an aid to controlled selectivity. Striking colored tabs, easily recognized at a glance, permit greater precision in filing and finding. They also enhance the appearance of a file and act as a check on errors. Especially recommended for large-volume filing.

KARDEX STOCK CONTROL CARDS

Kardex Stock Control Cards fit both Kardex Cabinet slides and Kardex Book Units. Card setup allows for complete history of stock movement. Spaces provided for recording date received, quantity, date issued, amount, and balance left in stock. Visible signals disclose when minimum is reached, or when stock reaches depletion point. This makes for intelligent replenishment and averts unnecessary delays.

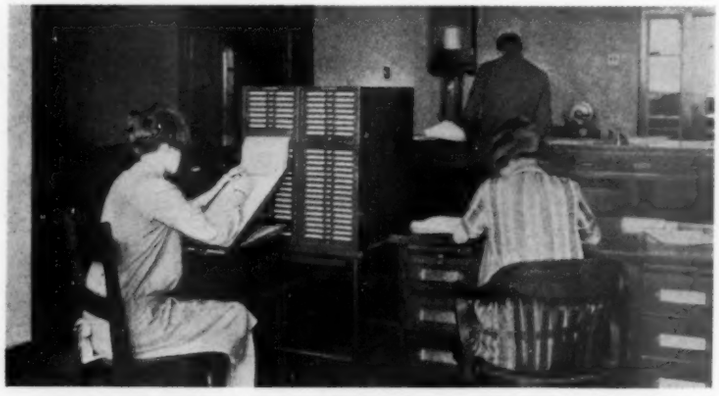
KARDEX STUDENT RECORD CARD

Kardex Student Record Cards are designed to give, quickly and accurately, the complete school history of every registered student. Principals and other administrative officers find this system of visible control invaluable to the smooth functioning of the school program. A glance at the card instantly tells what students are falling behind in their classes, those who need extra help, or merit rapid promotion. Kardex reveals the consistently tardy or absent pupil, those in need of medical attention, the "I. Q." of every student; in short, his or her complete record from first grade to graduation from Senior High School. A student's permanent record may be called on by his teachers, parents, prospective employer, and even the student himself. Copies may be sent to colleges requesting student's complete record.

REMINGTON RAND ADMINISTRATIVE SYSTEMS AND EQUIPMENT

Filing Cabinets
Filing Supplies
Card Record Systems
Visible Reference Equipment
Visible Binders
Office Furniture
Lockers
Steel Shelving

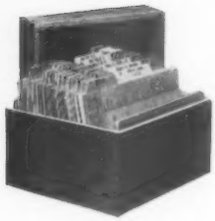
SEND FOR NEW BOOKLET—"SCHOOL RECORDS AND EQUIPMENT"



Remington Rand Administrative Equipment and Supplies in the Administrative Office of the Academy High School, Erie, Pa.

COMMERCIAL CLASSROOM EQUIPMENT

PRACTICE FILING OUTFITS



Remington Rand's Library Bureau Practice Method of Teaching Filing is unique in that it brings the student into direct contact with actual filing work. "Learning by doing" is the guiding principle of this new plan of learning to file. Students of this course first familiarize themselves with the essential rules of indexing. Then they apply these rules by becoming "file clerks" in a fictitious New York City company. They file miniature correspondence in miniature folders behind miniature guides. Thereby, learning to master the intricacies of the various forms of filing.

VISIBLE RECORD OUTFITS

New Remington Rand practice method is designed to acquaint students with the fundamentals of visible record control. Each pupil works with a model visible system, sets up the record, makes entries, establishes a visible signal control and draws conclusions from the posted facts. A full-sized 6-tray Kardex Cabinet is furnished. Five of the slides are fitted with cards illustrating personnel, prospect, stock, ledger and sales records. The sixth slide has Kardex pockets only. Teacher's task made easy by following authoritative textbooks and guides. Schools purchasing a complete set of visible record equipment are entitled to a free correspondence course and Question and Answer service.

PROGRESSIVE INDEXING AND FILING TEACHERS' KEY AND TEACHERS' GUIDE

Written in a clear, comprehensive manner, "Progressive Indexing and Filing" furnishes an outline and supplementary material for the practice course in filing. Carefully planned, progressive steps, from elementary essentials to the more advanced phases of filing, aid the teacher who conducts the course. Pertinent questions at the end of each chapter suggest points for class discussion and recitation.

Supplementing this text are a Teachers' Key and Teachers' Guide. Both booklets serve as an aid in presenting the subject of filing. They also assist in checking and measuring the work which the students perform with the practice outfits.

ALPHABETIC INDEXING AND FILING WORK BOOK

A new Work Book supplements the textbook, "Progressive Indexing and Filing." Contains definite rules and standard practice instructions conducive to simplified filing methods observed in business offices. Material written in clear, thorough manner, easy for students to absorb. Over 100 job lessons carry students through all phases of indexing and filing. Large quantity of perforated sheets follow job assignments. Each sheet in turn perforated to make six filing slips. Slips can be used as cards.

Students working on Vertical Practice Filing Outfits, Commercial High School, Atlanta, Ga.

REMINGTON RAND CLASSROOM PRODUCTS

Textbooks on Visible Record Keeping

Textbooks on Filing

Practice Equipment for Teaching Filing

Demonstration Material for Office Practice

Bookkeeping Instruction Equipment

SIGHT CONSERVATION EQUIPMENT

TYPEWRITERS WITH LARGE TYPE NOW USED BY PROGRESSIVE SCHOOL SYSTEMS IN SIGHT CONSERVATION CLASSES FOR CHILD EDUCATION IN PRIMARY AND ELEMENTARY GRADES FROM COAST TO COAST.

EMINENT EDUCATORS ENDORSE LARGE TYPE MACHINES AS ESSENTIAL TO PROGRESS OF THOUSANDS OF PUPILS IN LOWER GRADES WITH POORLY DEVELOPED EYESIGHT.

"WORK IS BROUGHT CLOSER TO STUDENTS WITHOUT EYE-STRAIN."

MACHINES ALSO USEFUL FOR PREPARATION OF BULLETINS, PROGRAMS, TEST PAPERS, MENUS, SEAT WORK, AND KINDERGARTEN ACTIVITIES.

Remington Large Primer Type No. 47

Letter Spacing - Eight to the inch

LARGER PRIMER . . . especially well adapted for kindergarten use, first and second grades. Equally effective for pupils in intermediate grades who have subnormal vision. Dr. Thomas D. Wood of Columbia University states that, "Approximately 3,000,000 children in the United States, one eighth of the entire school population, are handicapped in their education by defective eyesight."

No. 16 Remington Standard Typewriter

Remington Magnatype No.105

Letter Spacing 6 to inch

MAGNATYPE . . . the all-around type, endorsed by the National Society for Prevention of Blindness, for general use. Cuts better stencils, and is much in demand by teachers. Over 150 large-type machines are used in the 92 sight conservation classes in New York City.

No. 5 Remington Portable Typewriter

This is Double Case Bulletin Type excellent for bulletins and notices.

BULLETIN . . . as shown, Bulletin is well suited for making bulletins and notices. Excellent for work copies. Work is much more legible and easily preserved for filing and future reference. Los Angeles schools use over 400 machines equipped with these large type styles.

FOR MOVIE TITLES, NEWS BULLETINS, & SIMILAR WORK.

LARGE BULLETIN . . . preferred where messages must be read from distances, such as movie titles, screen slides, and posted bulletins. Used in extremely substandard cases.

We are glad to be here.
We are glad to be here.

Ww ane glad to be here.
We are glad to be here.

Martha Jane Watson
Age 7

juyj jmnj jmnj kik
dedcd swsxs aqazza
lol.l ;p;/; frtf f
jhfg kik,? jjjjjj

Once there was

Alice. She lived

Near the house was

where Alice played.

Characteristic of the work accomplished in the Primary and Elementary grades are these two specimens (one shown only in part) of seat work typed by two first grade pupils. The touch method of typing was used exclusively. Emphasis was placed on accuracy and neatness. Students had normal eyesight.

Remington Rand typewriters, No. 16 and Portable models, are equipped with large sized type. Magnatype 105 and Bulletin type 48 are endorsed for Sight Conservation by the National Society for Prevention of Blindness. Primer types are recommended for general use. Type obtainable in either double or single case letters. Both the Model 16 and the Portable operate smoothly and quietly. A child in kindergarten can operate either with a minimum of effort. Durably built to stand hard abuse. All known typewriter improvements make these machines essential to any curriculum having to do with typing or Sight Conservation. Further details furnished on request.

Primary grade pupils doing seat work with Remington Portable typewriters

ART METAL CONSTRUCTION COMPANY

Jamestown, New York

BRANCH OFFICES

Albany, N. Y.
Baltimore, Md.
Boston, Mass.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Detroit, Mich.
Hartford, Conn.
London, England
Kansas City, Mo.
Los Angeles, Cal.
Memphis, Tenn.
Newark, N. J.
New York City, N. Y
Philadelphia, Pa.
Pittsburgh, Pa.
Washington, D. C.

600 SALES AGENTS IN ALL PRINCIPAL CITIES

FOREWORD

SCHOOL and university administrators and architects are aware of the function which proper modern equipment plays in a progressive educational environment. As manufacturers of such equipment we recognize our obligation to the school and to the architect—the obligation to study school requirements and to produce equipment scientifically designed to serve such requirements; to insure the quality of the product; and to co-ordinate increasingly the improved product with the improved practices in education.

The Art Metal Construction Company, Inc., has prepared in the following pages a functional application of its products and services to modern school building situations. The scope of its furniture—from the most modern desks, tables, bookcases, safes and visible files for the administrative office to special equipment for the library, corridor, laboratory, shop, lecture rooms, and storeroom—is an illustration of its wide interests and services.

The services of our consulting staff are available to architects or educational executives who may wish assistance in the planning of school administrative office, libraries and other departments.

FOR THE ADMINISTRATIVE OFFICE

- Cards for Record Keeping
- Filing Cabinets
  - Letter Files
  - Card Files
  - Counter-Height Files
- Desks
- Office Counters and Tables
- Safes

FOR THE CLASS ROOM

- Storage Cabinets
- Tables
- Bookcases
- Blackboard Partitions
- Wardrobe Cabinets
- Steel Lockers

POSTINDEX VISIBLE FILES

- Student Permanent Scholastic Record
- Health Record
- Student Program Record
- University Student Analysis and Guidance Record
- Attendance Record
- Student Employment Record

FOR THE LIBRARY

- Bookcases
- Bookstacks
- Cabinets
  - Filing
  - Storage
- Card Catalog Drawers
- Cards, Record-Keeping
- Counters
- Counter-Height Files
- Desks
- Doors—Metal
- Glass-door Shelving
- Lockers
- Newspaper Holders
- Newspaper Racks
- Museum Cases
- Shelving
- Tables
- Wardrobes

ART METAL FOR THE ADMINISTRATIVE OFFICE

MODERN FILING CABINETS

Art Metal cabinets have kept pace with the times. Producers of steel office equipment for nearly fifty years, Art Metal offers a product which is the result of scientific research and sound engineering. Features incorporated include: All-welded construction, latest cradle-type suspension, locking device, friction clutch compressor, bronze hardware, quick-action thumb latch, snap-out guide rod and rubber silencers. Olive green is the standard finish. Mahogany, walnut or oak graining is obtainable at a slightly increased price.

Letter Files
Card Index Files
Cap Files
Document Files
Check Files
Transfer Cases and Files for all standard forms. Catalogs on request.

"1500" LINE DESKS

Working convenience, strength of construction and attractiveness of design have been incorporated in the Art Metal "1500" Line Desks to give the utmost in desk value. Only a manufacturer with Art Metals' facilities could place a desk of this quality on the market at its present price. "Artolin" tops, bronze drawer pulls and footings, easily working and conveniently arranged drawers are features of this line. The lock control is located in the knee space. Thirty styles and types of desks and tables for all school office work. Catalog on request.

FIRE SAFES

Protection of vital records is necessary in the registrar's, bursar's and superintendent's offices. An increasing number of school and university executives are recognizing the need and are obtaining the security which comes with installation of Art Metal safes. These safes carry Underwriters' inspection labels. Class AT-20 indicates the safe is effective in withstanding severe fire (reaching 2,000° F.) for at least four hours before interior temperature reaches 300° F. and in withstanding while in highly heated condition, impact due to falling 30 feet in the clear. Class BT-20 indicates the safe is effective in withstanding the same temperature for a two-hour period with the same impact test. Underwriters' T-20 designation which qualifies the safe as secure against all usual attack except use of explosives. Ten safes in seven different cubic capacities comprise Art Metal A and B model safes.

ART METAL FOR THE CLASSROOM

SPACE-A-SHELF UNITS

Art Metal Shelf-a-Space Units offer extremely low cost book storage with good appearance. These units have detachable ends which results in space saving where several units are placed side by side. The standard library shelves with which these units are equipped are slotted to provide easy adjustment without fastening. They may be shipped or moved K.D. but are permanently rigid when assembled. The standard finish is Art Metal Olive F, although any plain or grained finish may be had at small extra cost. (Illustrated at left.)

STORAGE CABINETS

Prevent the continuous loss of time and of office supplies by providing Art Metal storage cabinets. Inventory keeping is greatly aided by having a place for every form and item of supply. Art Metal Cabinets cost but a portion of the savings they make possible. In schools everywhere they are being used for storing supplies, file binders, books, hats, coats and hundreds of other miscellaneous items. Whatever the need, there is an Art Metal Cabinet to meet it. Ask for Catalog of Storage Cabinets.

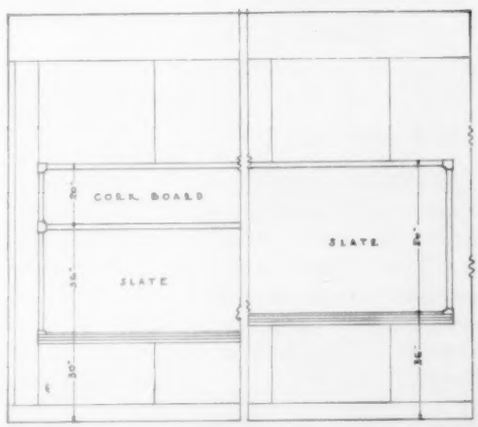
BOOKCASES

Art Metal Sectional Steel Bookcases are sturdily built and are equipped with disappearing glass doors with a new channel and roller construction which operates smoothly and easily. All sections, tops and bases are attractively and durably finished in Art Metal Olive, Mahogany, or Walnut. If the need is for book storage at a lower cost Art Metal manufactures Space-a-Shelf Book Units. These have detachable ends and standard library shelves. Slotting provides easy adjustment without fastening. These may be shipped knocked down but are permanently rigid when assembled.

ROOM AND OFFICE PARTITIONS AND BLACKBOARD FRAMES

Art Metal Vertical Unit, flush type sound-proofed, partitions are especially adapted for school use.

Modern blackboard equipment demands a frame which is strongly constructed and at the same time of attractive appearance. The accompanying sketch shows standard type Art Metal blackboard frame on the right. On the left is a combination frame providing for a corkboard bulletin space immediately above the regular chalk writing space. Catalog on request.



POSTINDEX VISIBLE FILES

For School and College Records

STUDENT PERMANENT SCHOLASTIC RECORD FOR PUBLIC SCHOOLS—C-4077-P

This is a four-page card providing for record of grades earned by student during Elementary, Junior and Senior High School. In addition, this four-page form includes general information about the student, information about parents, with a record of school activities, athletics, special abilities, standardized tests and educational plans, such as is being demanded by modern trends in education.

HEALTH RECORD FOR PUBLIC SCHOOL STUDENTS —C-4076

This four-page form is of the type needed in connection with periodic health examinations and follow-up of treatment. One page of this form is designed to particularly cover additional items required in the examination of High School students. Space is also provided for record of illness absences and treatments.

STUDENT PROGRAM RECORD—B-2027-8-P

This is a typical example of card used to show student's program by days and periods.

UNIVERSITY STUDENT ANALYSIS AND GUIDANCE RECORD—OG-0154-8

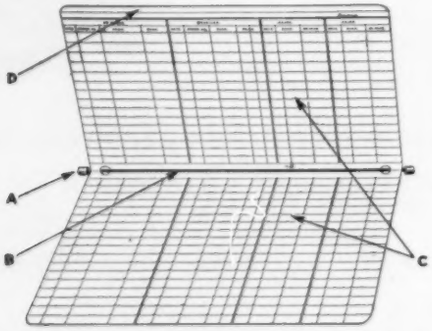
This record is typical of records now being used in Universities and Colleges for guidance and vocational analysis. The four-page form, 8 x 10½ when folded, gives liberal space for recording information such as social history, preparatory school background, college activities, personality development, vocational experience, vocational ambitions and educational counselling record.

UNIVERSITY AND COLLEGE STUDENT ATTENDANCE RECORD—C-4676-8

This four-page card has found favor among several Universities and Colleges for complete attendance throughout the college year. One of the back pages provides for information on outside activities and the other back page is horizontally ruled for special notes.

UNIVERSITY AND COLLEGE STUDENT EMPLOYMENT RECORD—C-4687-8

This form is used by leading Universities to take care of problem of providing employment for student while attending school. It provides sufficient information for an analysis of student's qualifications and also devotes space to follow-up of employment.



THE SIMPLICITY OF THE POSTINDEX VISIBLE FILE PRINCIPLE

A. This is the trunnion that operates in the channel at the side of the panel.

B. This is the anti-rust tempered spring wire card holder. Form may be inserted or removed from panel instantly.

C. This shows two pages of the four-page form, which gives a writing area on an 8 x 5 inch form of 160 square inches, equal to a ledger page of 10 x 16 inches.

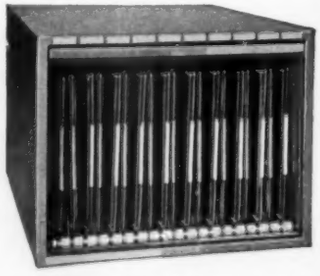
D. This shows the visible line where are typed the name and address or the subject of the record.

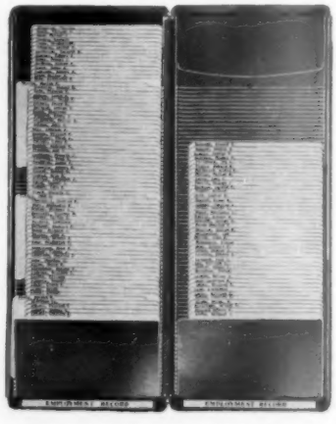
POSTINDEX DRAWER CABINET VISIBLE FILE

POSTINDEX cards are always ready to use. There are no clips to be added. No holes need be punched. No edges need folding over. The cards require no glued-on tabs. After typing or writing the student's name and other information necessary, it takes but a moment to insert the wire in the holes and snap it into the panel frame where the record stays ready to serve instantly.

Changes and additions are quickly and easily effected in POSTINDEX files because of the exclusive POSTINDEX card holder. The user needs but to snap it out or in. POSTINDEX offers the fastest record changing medium on the market. If the records are kept up-to-date by ink, the left hand can find the cards desired while the right hand enters the information. The right hand need never lay down the pen.

Just as the pace of today's business demands the best methods, so does the constant intake and graduation of students in schools require the most convenient and swiftest device for keeping grades and noting changes. POSTINDEX solves the problem as no other system or device.



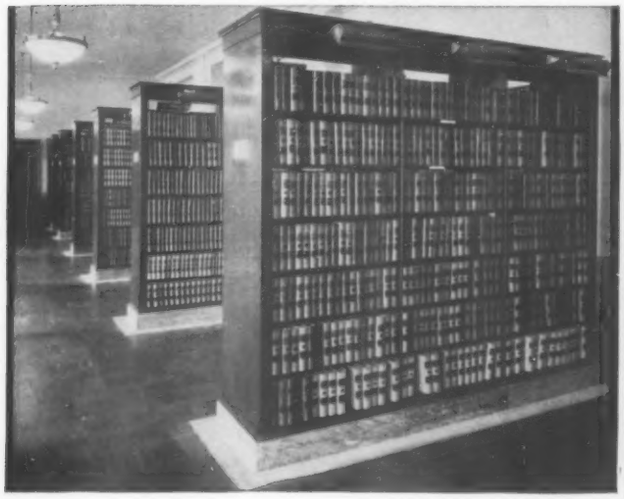


Adaptable to Any Record. Four Types of Cabinets

POSTINDEX FLAT-BOOK VISIBLE FILE WITH CABINET

Imagine a book of 300 or more pages, so condensed and so well organized that you would know, simply by opening the cover, exactly what you would find on every page of the book! A single POSTINDEX Flat-Book makes an average bookful of record information as available as that. A sufficient number of them will give the superintendent an instant picture, vivid as a photograph, of the entire school registration.

ART METAL FOR THE LIBRARY



BOOKSTACKS

Art Metal Library equipment is used in many schools and universities as well as in a large percentage of the modern libraries in this country. Shown in the accompanying illustration is a series of bookstacks of Art Metal construction. These are the free-standing, two-faced type. Also in popular use is the superimposed self-supporting tier type of stack. In this type bookstack each tier is separated by a deck floor which is supported by the tier or tiers beneath.

MUSEUM CASES

Shown above is a recessed wall case recently installed in a new school building. Cases of this kind are particularly advantageous in displaying educational exhibits. The above case is about twelve feet long and is equipped with semi-indirect lighting which emanates from behind the central pilaster. It has sliding doors. These cases can also be furnished with doors hinged at the top or side and also with panels which are removable.

ART METAL AIRLINE DESKS

For School Offices

FEATURES

- New Unique Beauty
- Highly Functional
- Concealed Wiring
- Convenience Tray
- Removable Card Trays
- Adjustable Vertical Drawer Partitions

Style 1760 F.B.

The keynote of beauty in Art Metal's new desk creation is obtained by the gracefully rounded edges, Island Bases under each pedestal, black Artolin top with White Satin finish hardware. All metal desk improvements, evolved during Art Metal's fifty years of pioneering in the metal desk industry, have been incorporated into these desks. Provision has been made for concealed wiring. A convenience tray for stenographic supplies may be inserted in place of one sliding reference shelf. The "In-Desk" tray provides two compartments for letter size papers and one to hold legal size papers. Top tray of the series of three may be lifted out and used as a desk top tray. Adjustable vertical partitions for division of drawer space make convenient compartments for stationery. Other desks in this popular group are: Fixed Platform Typewriter Models (single and double pedestals); Single Pedestal Clerical Model; Secretarial Model with Typewriter in either Pedestal; Drophead Platform Typewriter Models (single and double pedestals). Catalog sent on request.

DIEBOLD SAFE & LOCK COMPANY

CANTON, OHIO

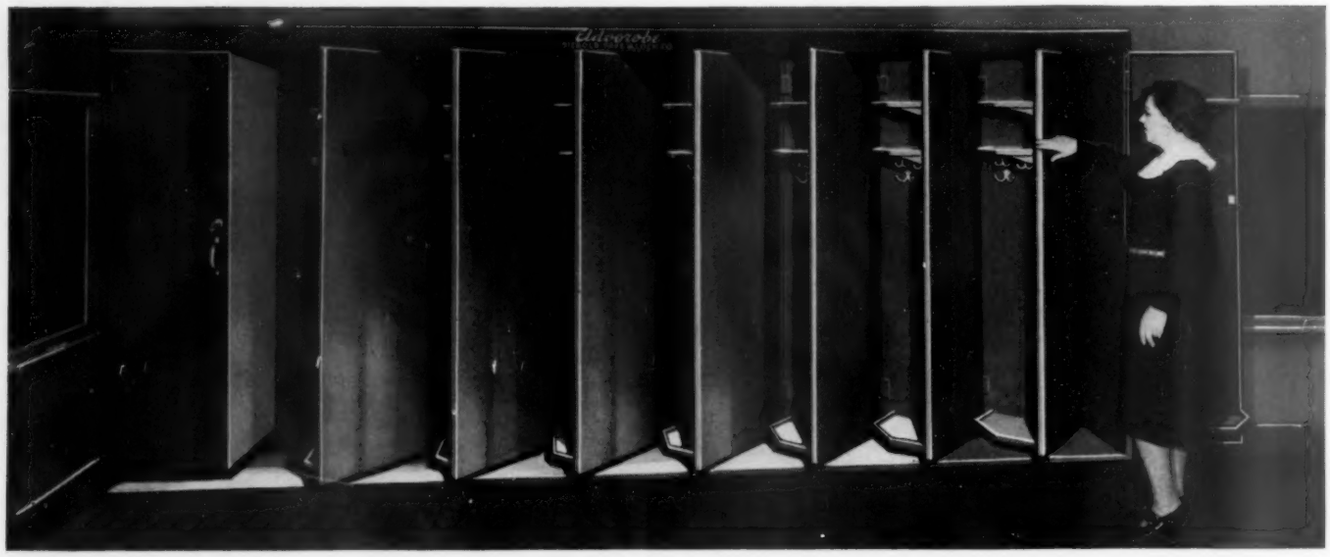
BRANCH OFFICES

New York	Boston	Pittsburgh	Detroit	St. Louis
Philadelphia	Washington	Cleveland	Chicago	St. Paul

LOCAL REPRESENTATIVE

[ ]

DIEBOLD ELDOOROBE



Easy to Operate — No Levers or Catches to Release

Pleasing Appearance

ELDOOROBES

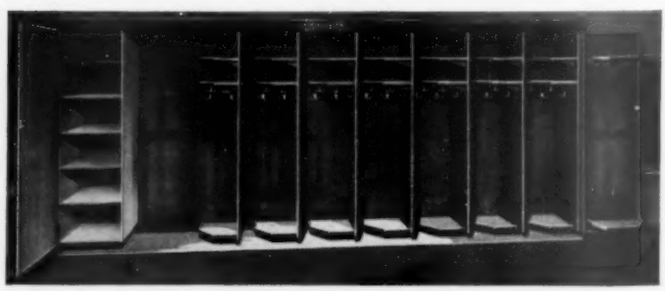
Maximum Capacity . . . Minimum Space

The Diebold Eldoorobe will accommodate forty or more students with ample space for clothing storage. It has seven closets, one storage cabinet for books and supplies, and one teacher's wardrobe. All compartments are controlled from the teacher's wardrobe, thus placing in her hands absolute control of the unit and its contents.

There are no doors swinging out into the aisle. The closets open flush with the front of the unit permitting unobstructed use of the aisle and easy access to the storage cabinet. The entire unit can be opened or closed in three seconds with the least possible effort. There is no complicated mechanism to get out of order. The operation is entirely noiseless and positive. The unit is built to last indefinitely.

The Eldoorobe is designed to fit into the standard ventilation system of the building. Air is drawn into the bottom of the unit, up through the lockers and out through the perforated top into the standard ventilating stacks of the building.

Eldoorobes can be placed anywhere in present schoolrooms, or recessed into walls of new or remodeled buildings. Write for complete details and specifications.



Free Access to Robe Closets — No Lost Aisle Space

SYSTEMS AND PROTECTION EQUIPMENT

FIRE-RESISTIVE SAFES

For balanced protection . . . Space economy

Modern Diebold fire-resistive safes are built to meet the exacting requirements of modern testing methods and bear labels certifying the degree of protection they afford.

There is a complete range of styles and sizes of Diebold Safes available. A wide variety of interior unit arrangements may be obtained. Illustrated is the Receding Door Safe. This type is ideal where floor space is at a premium . . . for battery installations . . . for placing in odd corners where a safe of the conventional swinging door type could not be used.

As a guide for users we have a Fire Hazard Analysis Chart with which we can measure the fire hazard of your building and so judge whether or not the protective equipment you now have is adequate. Inadequate protection may mean irreparable loss. Let us compare the degree of protection you now have with the degree you should have.

MODERN FIRE-RESISTIVE VAULT DOORS

Replace Old Style 10-minute Doors

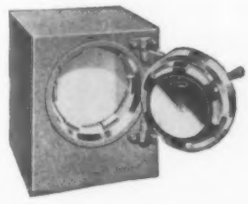
If past and present records are worth protecting at all they must be worth more than 10 minute protection. Actually, that is the amount of protection given your records by an old style uninsulated plate type vault door . . based on tests made by the Underwriters' Laboratories of Chicago.

Diebold insulated flat sill vault doors are scientifically designed and tested to withstand 1, 2, 4 or 6-hour fires.

All Diebold Vault Doors bear labels certifying the degree of fire they are built to resist. If you are in doubt as to the protection your door affords, write us today.

CASHGARD CHESTS

Reduce Insurance Rates 70%



Diebold Cashgard Chests are designed to protect money and securities from burglarious attacks They will reduce burglary insurance premiums by 70% and more . . and keep on returning these savings long after they have paid for the chest.

They are ideal for treasurers . . . athletic boards . . . laboratories where valuable equipment and supplies of precious metals warrant protection.

At the Box offices a type of Cashgard Chest can be selected that will provide holdup as well as burglary protection.

Wherever money and wealth accumulate Diebold Cashgard Chests are invaluable in defeating holdups and burglaries . . . and at the same time materially reduce insurance costs.

DIEBOLD SECTIONAL DRAWER VISIBLE FILES

For Flexibility and Economy

This filing system is the fastest, easiest operated, most convenient, and economical visible filing system obtainable. Diebold Sectional Drawer Visible Files offer unlimited flexibility. You install only the number of drawers desired, and add additional drawers as needed.

Forms are instantly removed and quickly replaced. Additional forms are just as easily added in their proper place. If the records are typewritten, the forms will easily pass through a typewriter without removing the wire hanger.

Every type of School record can be housed in Diebold Sectional Drawer Visible files. Student Scholastic Records, Student Health Records, Student Program Records, Alumni Records, and Matriculation Records are just a few of the educational records that may be housed economically in these units . . . with the greatest accessibility and visibility obtainable for each record.

DIEBOLD REFERENCE PANELS

For Fast Indexing . . . Quick Reference

For complete indexing of records, Diebold Reference panels offer outstanding advantages . . . maximum capacity . . . clear visibility . . . easy, fast, insertion and removal . . . accurate signaling and coding. Cards will not overlap in handling. Wall and swinging panels are available. Swinging panels may be hung in wall, table, or rotary racks. Many thousands of one line records can be conveniently placed for quick accurate reference.

Wherever complete indexing for . . . fee accounts—class and student records, etc., is a problem . . . wherever one line reference for . . . telephone . . . addresses, etc., is needed; it will pay to investigate the Diebold line of Reference Panels.

DIEBOLD ROTARY INDEX

For Maximum Capacity . . . Greatest Efficiency

The Diebold Rotary Index filing system mounts vertical card records on a wheel . . . brings unthought of efficiency to record systems. 6,500 records are instantly available at the operators elbow. Each card is brought to the same position for reference work and remains in that position as long as desired. Visibility for reference and posting is the same as though the records were lying on your desk.

Records are found and removed in the twinkling of an eye—and are accurately replaced because the fan remains open in the desired place until the wheel is consciously revolved. New records may be added as easily as old ones can be removed and replaced.

The units are compact, and occupy the least floor space per thousand records of any filing method. Easily portable, the units can be removed from office to office, floor to floor without danger of damaging or losing the records.

If you are interested in housing and working on large volumes of vertical card records with the greatest efficiency and least effort, ask for a demonstration.

THE GENERAL FIREPROOFING COMPANY

Youngstown, Ohio

BRANCHES
BOSTON—74 Franklin Street
CHICAGO—36 S. State Street
CLEVELAND—1235-37 Prospect Street
HARTFORD—8 Ford Street
LOS ANGELES—1733-35 So. Los Angeles Street
MINNEAPOLIS—310 N. First Street

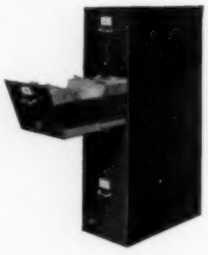
BRANCHES
NEWARK—17 Academy Street
NEW YORK—500 Fifth Avenue
PHILADELPHIA—2301 Chestnut Street
PITTSBURGH—642 Grant Street
ST. LOUIS—521-523 Arcade Building
SAN FRANCISCO—534 Fourth Street

WASHINGTON—201 Mills Building

Dealers Elsewhere. Write for Name of One Nearest You

Metal Office, Classroom and Cafeteria Equipment

RECORD FILING EQUIPMENT



Three, four and five-drawer Super-Filers for all types of records. The drawers of these cabinets have swing fronts that open as the drawer is opened and close as the drawer is closed, thus providing working space without any reduction of the filing capacity. Greater freedom of filing is secured, many of the ordinary operations of filing are mechanized. 18% more capacity, 25% faster filing. Three-drawer letter and cap files are of counter-height, four-drawer are standard height. The five-drawer cabinets give 48% greater capacity on the same floor space. Supplied with and without lock. No. 5404-L letter size unit as shown takes records up to 12¼" x 11⅝₂". No. 5404-C cap-size unit takes records up to 15½" x 11⅝₂".

COMBINATION CARD RECORD AND LETTER OR CAP-SIZE FILE

This file has two card index drawers at the top for 5 x 3 or 6 x 4 cards and three letter-size drawers for miscellaneous filing. Ideal for student records as the card record provides a means for cross reference. Also supplied with cap-size drawers.

CARD INDEX CABINETS FOR 5 x 3, 6 x 4 OR 8 x 5 CARDS

A wide variety of card index cabinets from single drawer units for use on top of a desk to twelve-drawer units as illustrated. Ten, eleven and twelve-drawer units for 5 x 3 cards; eight and nine-drawer units for 6 x 4 cards; seven and eight-drawer units for 8 x 5 cards, all in standard 52-inch height cabinets. Cabinets of counter-height also available.

LOWER-PRICED FILES FOR MISCELLANEOUS FILING

Four-drawer, rigid-front filing cabinets. These cabinets are of the conventional type, having rigid drawer fronts and compressors. Supplied in letter and cap-size, also in bill-size with five-drawers. Cabinets of similar grade also available in counter-height units.

SECTIONAL METAL BOOK CASES

Sectional Steel Book Cases. Strong, rigid inter-locking sections of various depths to accommodate books of varying heights. Sections are fitted with clear glass doors that operate on an equalizing mechanism that positively prevents wedging of doors when moved back into the cabinet. Non-warping construction. Bases and tops to match sections. Finished in oven-baked enamel—olive green or grained effects.

ADJUSTABLE BOOK SHELVING

Adjust-a-Shelf Book Units employ the same type of slotted shelf adjustment as standard library shelving of the larger installations. Units are supplied in 84-inch and 90-inch heights, each unit having a base shelf and six adjustable shelves. Adjustment slots are at one-inch intervals. Any number of units may be assembled together to form complete installations.

LIBRARY SHELVING

A special type of shelving for large libraries. Two types—free-standing and multiple-tier. Illustration shows part of an installation for the University of Minnesota. Engineering and consulting service for architects and building committees.

FIRE-RESISTIVE SAFES FOR VITAL RECORDS

Fire-resistive safes for student's records and college accounts. Highest rating of Underwriters' Laboratories for fire protection. Hundreds of cases of severe exposure and perfect performance of these safes attest their dependability. Interiors assembled from stock filing units to meet requirements.

WRITE FOR LARGE COMPLETE CATALOG OF METAL EQUIPMENT

METAL DESKS AND TABLES

Desks of 66″, 60″, 50″ and 45″ widths for office or instructor's use. Pleasing design, practical utility, durable construction and finish. Last for years minus repairs and refinishing.

Typewriter desks of 60″, 50″ and 45″ widths for business schools, commercial departments, school offices and boards of education. Full complement of drawers for records, supplies and filing.

Metal Tables for class rooms or offices, matching desks in construction and finish. 72″, 66,″, 60″, 50″, 45″ and 36″ widths.

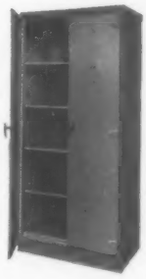
SECRETARIES

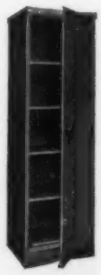
Secretaries for teachers' records and dormitory rooms. Serves as telephone stand, writing desk, study table. Drawers for manuscript, examination papers, stationery and card records. Space for portable typewriter and pull-out shelf for writing or typing.

STEEL SHELVING FOR SUPPLY STORAGE

Steel Shelving for general supply rooms. Quickly erected or altered to meet any and all conditions of space or stored materials. Skeleton type, semi-enclosed or fully enclosed with doors. Provides systematic and controlled storage of expensive supplies.

STEEL SUPPLY STORAGE CABINETS





Steel Storage Cabinets for classroom or departmental supplies. Adjustable shelves, dust-excluding doors with locks. Combination units for supplies and wardrobe purposes.

Double-door Storage Cabinet with four adjustable shelves. Outside dimensions, 36″ wide, 78″ high and 19½″ or 25½″ deep.

Single-door Storage Cabinet with four adjustable shelves. Outside dimensions, 24″ wide, 78″ high and 19½″ or 25½″ deep.

STEEL WARDROBES

Single and Double-door Wardrobes for teachers. Also may be assembled in batteries for pupils' wraps. Louvred backs for ventilation, hat shelf and coat rod in each cabinet. Doors fitted with automobile type lock handles. Outside dimensions of single door cabinet—24″ wide, 78″ high, and in 19½″ or 25½″ depths. Double door cabinets—36″ wide, 78″ high and 19½″ or 25½″ deep.

ALUMINUM CHAIRS FOR OFFICES, CLASSROOM, CAFETERIAS

Aluminum Swivel Chair for teacher's use. Light in weight and easily moved to and from desk. Genuine leather upholstery. Latest type swivel iron and ball-bearing casters.

Side chair companion to chair shown above. Strong, durable, light-weight aluminum construction.

Swivel chair for superintendent's office. An exceptionally comfortable and well proportioned chair. Made of aluminum. Upholstered in genuine leather. Light in weight. Ball-bearing casters and latest type swivel iron.

Tablet-arm Aluminum chair for classrooms. Strongly built, welded construction. Very portable and easily moved to facilitate sweeping operations.

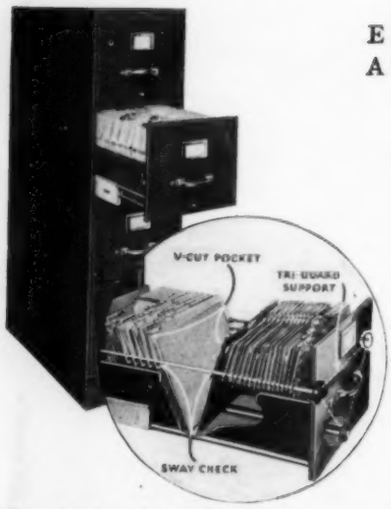
Also special chairs and tables for cafeterias.

WRITE FOR LARGE COMPLETE CATALOG OF METAL EQUIPMENT

THE AMERICAN SCHOOL AND UNIVERSITY

THE GLOBE-WERNICKE CO.

Ross and Carthage Aves.
Cincinnati, Ohio



The Tri-Guard principle is a revolutionary improvement in filing—exclusive with Globe-Wernicke. It makes possible unusual filing efficiency

ENJOY THE ADVANTAGES OF EFFICIENT AND ATTRACTIVE OFFICE AND LIBRARY EQUIPMENT

Modern Globe-Wernicke equipment and systems for schools, libraries and offices enable people to accomplish more work with less effort, keep office routine operating smoothly, increase efficiency and economy. For more than fifty years the products of this company have been famous for their dependable quality and fine craftsmanship.

Filing Cabinets

There is a G/W file for every business need and price range. Our better grades in steel and wood have many distinctive advantages, including the Tri-Guard principle—the outstanding filing development in years. Each guide slides on three rods, which act as a "sway-check" . . . they support, as well as index contents of the drawer . . . ample working space is available without frequent readjustment of follower. Tri-Guard files speed up filing and finding with less work and greater economy.

Sectional Bookcases, Steel and Wood

This company originated the unit idea in bookcases and has been the leader in their development. G/W sectional bookcases are available in several distinctive designs and standard finishes for school, home and office. They are carefully designed, well made and finished to combine attractive appearance, convenience, efficiency and economy.

Globe-Wernicke steel sectional bookcases protect books from dust and damage . . . more sections easily added . . . units include top, base and book sections of four different heights

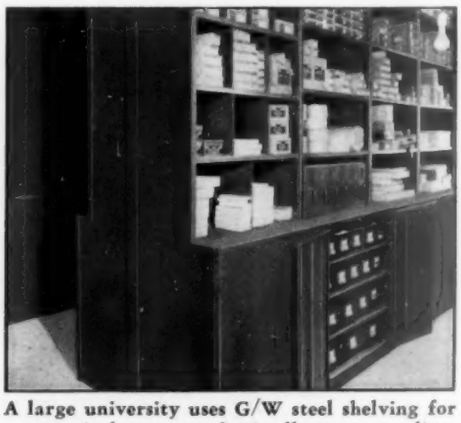
Steel Shelving

G/W steel shelving gives economical service for a business lifetime. It is easy to install and can be adapted to individual needs and floor space available. Additional units may be obtained for expansion and shelving can be taken down and reset with 100% salvage.

Steel Desks and Tables

Many exclusive features of construction and design make G/W steel desks and tables very desirable for office and school use. They are attractive, sturdy and give satisfactory service for a long time.

Globe Art steel typewriter desks are giving efficient service in the Elliott School of Business at Wheeling, West Virginia

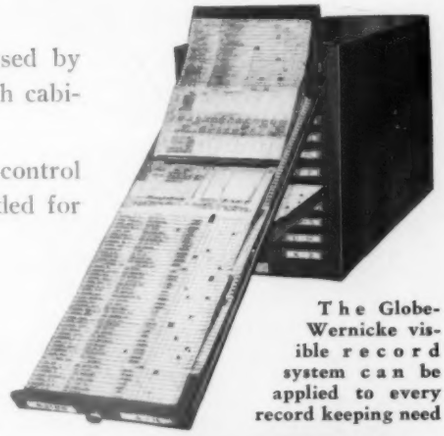


A large university uses G/W steel shelving for economical storage of miscellaneous supplies

Visible Record Equipment and Supplies

Visible records provide important facts instantly. They can be used by every business or institution where it is necessary to keep records. Both cabinets and books are available in various styles and sizes.

Signals call attention to matters that need prompt attention. This control system saves time, work and money. Stock or special forms are provided for any type of record.



The Globe-Wernicke visible record system can be applied to every record keeping need

Storage and Wardrobe Cabinets

G/W steel storage and wardrobe cabinets are made in two grades and several sizes. Contents are kept clean and quickly accessible. Loss is prevented and privacy assured. They are fire resistant and practically dustproof.

There is a size and style of storage and wardrobe cabinet to fit the floor space available and for every requirement

Book Shelves

Slotted type book shelf units offer an economical, space-saving method of housing books. Removable end panels permit expansion. Extra units may be added as desired. Book shelf units are regularly furnished with six shelves adjustable every half inch.

Steel slotted type book shelving is used for storing books in many school libraries and offices . . . slotted uprights have one inch shelf adjustment

School and Library Equipment

If you are planning additions to your school or library equipment, let Globe-Wernicke engineers and experts help solve your problems. You can benefit by our long experience in this field. We are glad to co-operate with architects, builders and committees.

Globe-Wernicke products include steel and wood filing cabinets and supplies, steel desks and tables, storage and wardrobe cabinets, sectional and solid end bookcases, steel shelving, visible record equipment and supplies, book shelves, stock and special equipment for schools, libraries and public institutions and a large variety of office accessories; also steel and wood partitions.

Write to us for more information about any Globe-Wernicke products and name of nearest dealer

This illustration shows a typical installation of Globe-Wernicke library equipment in a midwestern high school

Globe-Wernicke supplied these "made-to-order" herbarium cases for Cornell University, Ithaca, N. Y.

BERGER MANUFACTURING DIVISION

REPUBLIC STEEL CORPORATION

Canton, Ohio

Two-Person Lockers

BERLOY STEEL EQUIPMENT is manufactured by an organization that **knows** the needs of the modern school and university. Built to meet the most rigid requirements for durability, utility, and structural perfection Berloy Steel Lockers, Cabinets, and Shelving nevertheless can be purchased at prices quoted for the commonplace.

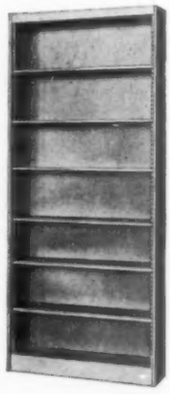
Berloy Steel Equipment possesses unusual beauty of design and finish. All items are quickly available in practically every size and type. Experienced Berloy Engineers will be sent anywhere to assist architects, builders, or purchasing agents in the planning of new installations.

Filing Cabinets

Teachers' Combination Cabinet

B BERLOY

"FIRST IN LOCKER VALUES"



Book Shelving

Students' Corridor Single Tier Lockers

Teachers' Combination Wardrobe Lockers

Students' Gymnasium Compartment Lockers

Students' Gymnasium Double Tier Lockers

DURABILT STEEL LOCKER CO.

528 Arnold Avenue, Aurora, Ill.

SALES OFFICES IN ALL PRINCIPAL CITIES

PRODUCTS

Steel Lockers for all purposes
Steel Storage and Wardrobe Cabinets

Steel Gymnasium Racks and Trucks
Table Tennis Tables and Equipment

THERE IS A DURABILT LOCKER TO MEET EVERY REQUIREMENT

For clothing storage, the Durabilt Lockers best suited to schools and gymnasiums are the specially equipped full length or Single Tier lockers either recessed in the walls, on concrete bases, or free standing on legs. Where Single Tier Lockers are not desired, we recommend the use of Double Tier Lockers. Multiple Tier Lockers (Box). Lockers are ideally adapted to storage of gym suits, books, sewing materials, etc. Combinations of any of these types, are of course, available. Durabilt Basket Racks and Trucks for gymnasiums, pools, etc., furnish well ventilated storage facilities.

Above are shown two Durabilt full length or Single Tier Steel Lockers, free standing on legs, one closed and one open; the latter showing standard equipment; hat shelf, double prong ceiling hook and single prong side hooks.

STANDARD LOCKER SPECIFICATIONS

Doors—Cold rolled, stretcher levelled 16-gauge special enameling steel with square tubular reinforcement housing the latching device, with a channel formation at the vertical edge on the hinge side, and with a flange on top and bottom. This is semi-flexible construction.

Frames—Uprights, 1 x 1 x ⅛ in., smooth, hard steel angles; cross members, 1½ x ¾ in. 14-gauge formed steel channels, joined by two 9/16-in. countersunk rivets at each corner.

Body—The remaining parts of locker are made of 24-gauge steel.

Lock Fingers—Extra heavy, reinforced fingers made to engage directly with door and so designed that door in closed position is always locked. **Fingers**, pick and tamper proof, and to release only by operating unlocking device. Three fingers riveted on single tier and two on double tier lockers. All fingers have rubber bumpers for silent operation. **Unlocking Device with Pre-locking Features**—Lockers equipped with unlocking device so that doors in closed position are always locked unless manually unlocked. This device so constructed that raising of handle silently disengages lock fingers allowing locker door to open. Designed to operate with all standard locks, to permit pre-locking, and to prevent accidental locking of door in open position.

Handle—Stamped steel (not cast) straight lift handle with curled grip providing ample space for comfortable hand-hold and attached directly to unlocking bar. Cadmium finish (chromium optional).

Padlocking Attachment—This attachment complete with rubber silencers furnished on standard single and double tier lockers at no extra cost.

Locks—Masterkeyed locks with two keys each. Combination locks or padlocks can be furnished when specified.

Hinges—Full-looped 5-knuckle "strap" hinge with concealed hinge pin.

Legs—Front legs integral with frame. Adjustable feet furnished. Rear legs also adjustable.

Tops—All lockers have flat tops unless sloping tops are specified.

Ventilation—Louvre perforations of modernistic design in doors, "safety type" 4½ in. wide, 3/16 in. deep.

Equipment—Single tier, one hat shelf 9 in. from top; double tier, no shelf, 12-in. wide lockers, one double prong ceiling and three single prong side hooks. Lockers more than 12 in. wide, one double prong ceiling and four single prong side hooks. All hooks arranged for attaching with two bolts. Coat rod furnished in all lockers 18 in. and deeper when specified.

Finish—Standard No. 350 Dark Green Baked Enamel and No. 466 Brown Baked Enamel. Other colors at reasonable extra cost. Coat hooks, bolts and nuts, Cadmium or Parkerized finish. All outside bolt heads are slotless type.

Number Plates—Modernistic design, solid brass, Butler nickel finish, 7/16-in. black filled numerals.

Sizes—Widths: 9, 12, 15, 18 and 24 in.; depths: 12, 15, 18, 21 and 24 in.; heights: 60 and 72 in. S. T.; 30, 36 and 42 in. D. T.

Multiple Tier (Box) Lockers

MULTIPLE TIER (BOX) LOCKERS

Multiple Tier (Box) Lockers conform in general with specifications of standard lockers with following exceptions:

Doors—Flanged on all edges.

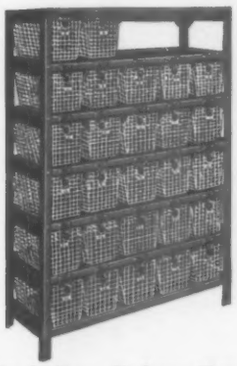
Frames—Same as standard lockers with 20 gauge intermediate channel members between door openings.

Combination Handle and Padlock Attachment—All Multiple Tier (Box) Lockers are furnished with neatly formed stamped steel (not cast) straight-pull curl handle combined with padlock attachment. When doors are closed, spring clips keep them shut.

Equipment—No hooks or shelves.

Sizes—Widths: 9, 12, 15 and 18 in.; depths: 12, 15, 18, 21 and 24 in.; heights: 12, 15, 18, 20, 21, and 24 in. Usually furnished in tiers four to six high. Also combinations of Lockers and Multiple Tier (Box) Lockers in all sizes.

BASKET RACKS AND TRUCKS



Single Row, Skeleton Type Rack

Double Row, Solid Ends, Truck

The use of steel racks and wire baskets is often preferred to Multiple Tier (Box) Lockers. This system is less expensive and gives the advantages of complete ventilation and makes the contents visible for inspection at any time.

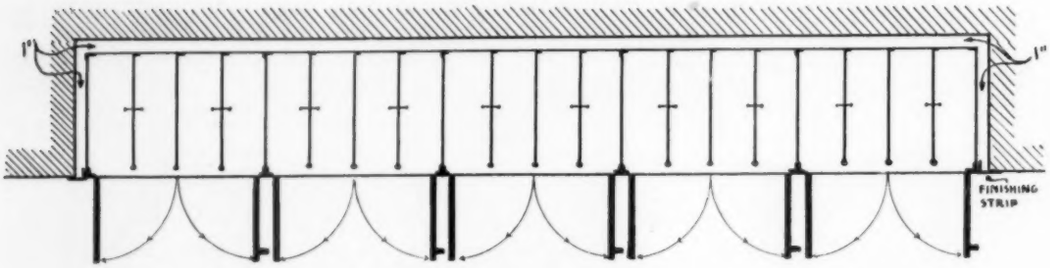
LYON METAL PRODUCTS INCORPORATED

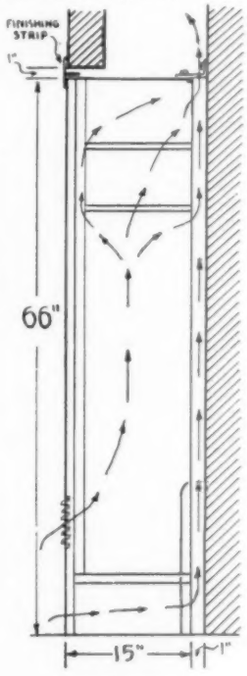
1336 Madison Ave., Aurora, Illinois

SALES OFFICES IN ALL PRINCIPAL CITIES
FACTORIES: Aurora and Chicago Heights, Ill.

CONSULT YOUR CLASSIFIED TELEPHONE DIRECTORY
PLANTS: Jersey City, N. J.; Los Angeles, Cal.

LYON LOCKER WARDROBE





Used With or Without Ventilating System

Base, back, and shelves are perforated; louvers in bottom of door when used with ventilation system. Doors louvered top and bottom and no interior perforations when unit used free standing on legs or built into wall without ventilating system.

PROVIDES CONVENIENT TEACHER SUPERVISION OVER PUPILS' CLOTHING

One lock controls all doors in a battery of up to ten units. Each unit accommodates four pupils. The teacher releases the locking bar and any one unit or all unit doors can be opened independently. When locking bar is engaged, the doors for each unit may be closed independently but cannot be opened until locking bar is released.

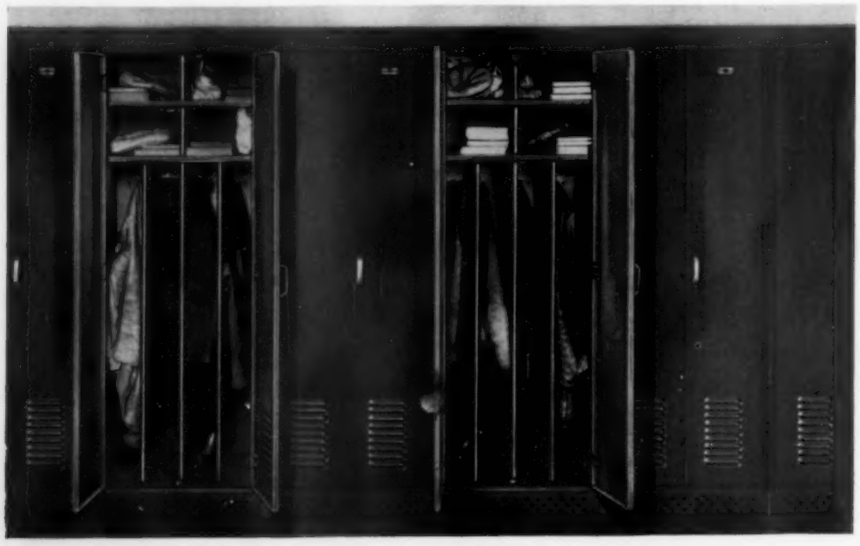
The teacher has full supervision over pupils' clothing. Each unit may be divided into four clothes and four book compartments, which provides a convenient means of keeping children's clothes separate. This feature tends to eliminate confusion, prevents loss and damage to clothing. There are several other interior arrangements to meet other individual requirements.

The locking device is simple and safe in operation. Only one key is required. It is practically impossible to foul the locking device.

All of Lyon proven locker refinements are built into these units. There are over 8,000,000 Lyon Lockers now in use. Millions more than any other make.

MONEY SAVING SPACE ECONOMY

NEAT ATTRACTIVE APPEARANCE



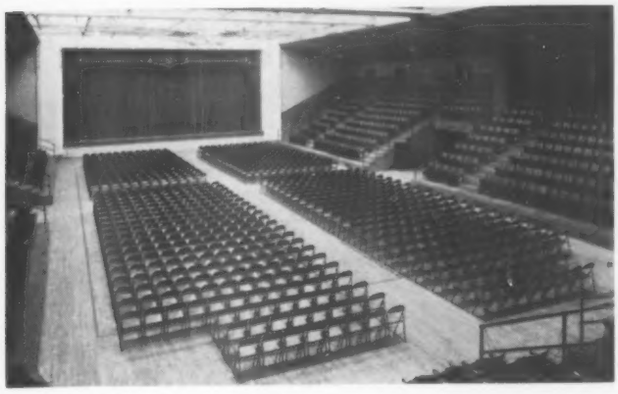
SANITARY — FIRE RESISTING

The unit requires no special wall or building construction. Requires only half the space of ordinary wardrobe. This means more economical and efficient school per dollar spent.

The entire unit may be recessed flush with the wall and neat finishing moldings applied. A very pleasing installation is obtained that harmonizes with other room furnishings.

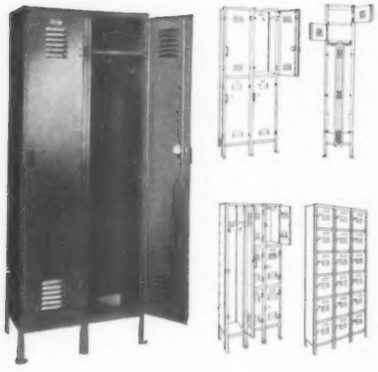
Being built of steel, the unit is vermin-proof, sanitary, and fire-resisting.

Write for Catalog No. 239, giving complete specifications and construction details.



FOLDING CHAIRS

The Chair that's "Posture Perfect." Wide, deep, curved seat fits the thigh and located with relation to the form fitting back to rest the entire body. Students will not slump down in an inattentive position. Channel steel frame, cantilever type seat, live rubber feet, pinch proof hinge, absolute rigidity and quiet operation assure absolute satisfaction and long life. Seat 15 5/16" wide 14½" deep, width of chair over all 16 5/8", height (open) 31" (folded) 35". Several styles available. Write for Catalog No. 835.

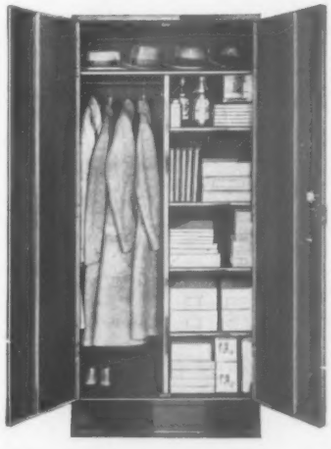


LOCKERS

For over 30 years Lyon lockers have served all types of institutions. Over 8,000,000 now in use. Millions more than any other make is ample evidence of their superior quality. A style for every purpose. Single tier, double tier, Two person, Gym type, Box locker, Double Door and Basket Racks. Write for Locker hand book No. 233.

LI-FLAT CABINET

Stores large papers, drawings, maps, etc. Five drawer sections set over closed or open base; additional sections may be added; no finishing mouldings are necessary. Drawers punched 2" on center for dividers. Write for Catalog No. 471.

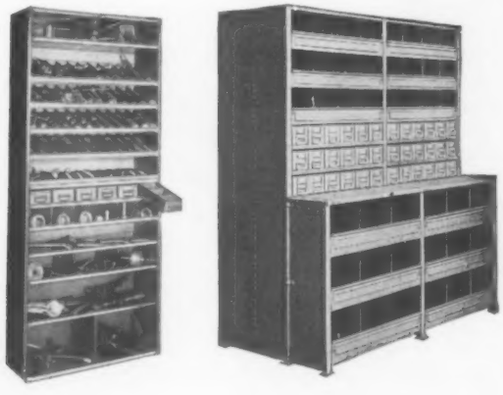


CABINETS

Many types for individual requirements. Storage with five adjustable shelves; Combination Wardrobe Storage (illustrated) Wardrobe, Desk High, Single door Wardrobe and Storage, Counter High, File-Hi. Roomy interiors permit storage of a surprising amount of clothing, supplies, etc. Write for Catalog No. 421.

STORAGE EQUIPMENT

Many of the largest industries have standardized with Lyon storage equipment. Flexibility, maximum adjustability and complete inter-change of parts makes possible efficient storage facilities. Write for Catalog No. 120.



SHOP EQUIPMENT

Vocational education warrants equipment used by modern industry, Catalog No. 323 will serve as a valuable hand book when planning for new or replacement shop equipment.

LYON SERVICE

Lyon representatives and factory engineers have for years assisted school executives in planning and selecting equipment. This experience qualifies them to give you valuable information. Request this service without the least obligation on your part.

METAL OFFICE FURNITURE COMPANY

Grand Rapids, Michigan

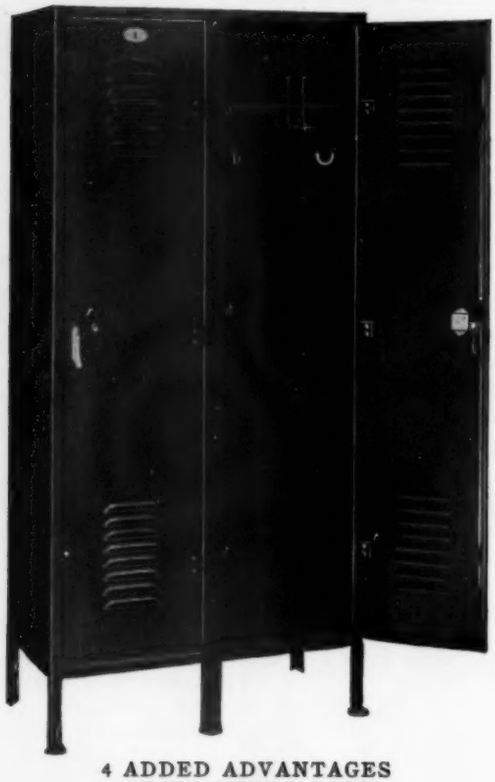
FACTORIES IN Grand Rapids Michigan

BRANCHES IN New York City 604 W. 37th St. · Boston 115 Purchase St. · Los Angeles 923 E. Third St. · Seattle 609 Third Ave.

DEALERS IN ALL PRINCIPAL CITIES

STEELCASE *Business Equipment*

TERRELL STEEL LOCKERS



4 ADDED ADVANTAGES AT NO EXTRA COST

Adaptability

A complete range of sizes and styles meets every need of school or gymnasium. Any grouping of full-height, double-tier or box lockers can be supplied.

Safety Handle

All fastening points are concealed in handle. Pilfer-proof, since handle cannot be pried off. Padlock eye is also concealed in handle.

Latching Bar

No meddling possible because it is enclosed and protected between return flange on door and a formed channel. This channel adds strength to the door.

Pre-Locking Device

Positive in operation, pick-proof, simple in design. Two working parts. When door is opened, padlock may be replaced and locked, or key turned, then when door is closed it is automatically locked.

Silenced Operation

Soft molded rubber bumpers are securely riveted and tenoned into door jambs. Similar bumpers silence latching bars. This eliminates noise.

Sturdiness

Rigid construction, acetylene welded frame corners, angle-type legs which are a part of the locker frame—these and other features add to the strength of Terrell Lockers.

Appearance

Attractive finishes, no weld marks, rust-proof bolts (none on fronts), concealed hinge-pins—these enhance the appearance of Terrell Lockers.

STEEL BOOK STACK UNITS

Here is modern steel book shelving in its best and simplest form—designed and built for the utmost in service for educational institutions.

Easily planned—easily installed—very reasonably priced.

Book Stack Units can serve you as efficiently as they are serving many other leading universities and schools.

SIMPLIFIED, MODERN STEEL BOOK SHELVING

Simplicity

Sold as units, no complicated parts to figure. Intermembering units (of varying widths if required), with duplicating parts omitted, match perfectly in building an assembly.

Sizes

Offered in an assortment of sizes—widths 30″, 36″, 42″—depths 9″, 12″—heights 6′ 6″, 7′ 6″, 8′ 6″.

Capacity

These Book Stacks will accommodate 10% more books than sectional glass door bookcases of the same height. Rounded front posts give maximum shelf width.

Flexibility

A combination of sizes for any space. Shelves adjustable every inch for books of any height. Easily and quickly rearranged.

Strength

The construction of upright posts, tops, bases and shelves insures strength and rigidity in every part. No sagging of shelves even under the heaviest load.

Protection

No rough bolts or raw edges of steel can come in contact with books or hands. Front edge of shelf is triple-flanged for added protection.

Beauty

Designed, built and finished to harmonize with the finest furnishings. The attractive cornice top adds a touch of conservative artistry to each unit.

METAL OFFICE FURNITURE COMPANY

Grand Rapids, Michigan

FACTORIES IN Grand Rapids Michigan

BRANCHES IN New York City 604 W. 37th St. | Boston 115 Purchase St. | Los Angeles 923 E. Third St. | Seattle 609 Third Ave.

DEALERS IN ALL PRINCIPAL CITIES

STEELCASE *Business Equipment*

DESKS AND TABLES

Four grades of desks and tables are available for every office requirement. Made in a complete range of types and sizes. The moderne, No. 5021, Flat Top Desk, as illustrated, is attractive, efficient, economical and will give a lifetime of service.

FILING CABINETS

Steelcase files are made in several grades of construction, in suspension and non-suspension types, in various heights from 5-drawer down to single drawer units, in a drawer arrangement for every purpose, in attractive and substantial finishes.

SECTIONAL EQUIPMENT

Adaptable to large offices or to small departments or offices where requirements are limited to no more than a single letter file and a card index file. Extreme flexibility of wide and narrow sections permits additions to serve every need.

STORAGE CABINETS

Twenty-one sizes and styles of cupboards and wardrobes provide a stock unit for every storage requirement. They are attractively finished, strong and sturdy in construction and very convenient and adaptable in use.

BOOKCASES

These glass door bookcase sections are substantially constructed units, carefully designed and built. Doors are of disappearing type, dust-proof with equalizing device. Three heights, with top and base, intermember perfectly, permitting easy expansion.

SHELVING

Three types of steel shelving provide the proper kind for use wherever shelf storage is required, whether in libraries where an attractive appearance is necessary or in store-rooms where heavy loads require reinforced shelves.

Built-to-Order Equipment

Display and Museum Cases

Write for Details

SAFES

Steelcase safes are furnished in two grades — a Class "B" and "T-20" Grade for extreme risks where safety and protection of records is most important and a Commercial Grade for less exacting conditions. A full range of sizes.

SECURITY STEEL EQUIPMENT CORPORATION

Avenel, New Jersey

DEALERS IN ALL PRINCIPAL CITIES

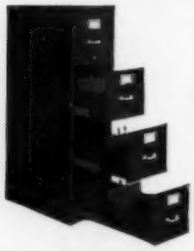
Security STEEL

"SUPERIORITY IS INHERENT IN ALL PRODUCTS"

STANDARD AND PLANNED OFFICE EQUIPMENT

FILING EQUIPMENT

7700 Line Files



No. 7701

These files include every improved feature and constructional refinement developed in recent years.

Built with the famous Security Progressive Cradle-Type Suspension, these files will withstand the demands of the heaviest filing requirements.

No. 1701

LOW-PRICED FILES

1700 Line

Where utility plus economy is the prime factor, our "1700 Line" is the answer.

Constructed to high Security requirements, the drawers will not sag, even when fully extended.

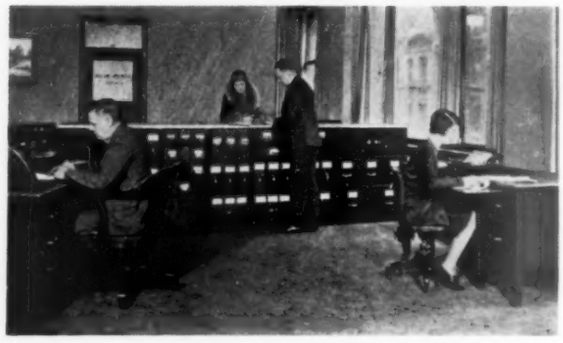
Security Files are available in 5 Grades and 5 Heights. Standard finishes are olive green, walnut and mahogany.

LIBRARY EQUIPMENT

SECURITY STEEL Library Shelving has no sharp corners or edges that might harm a binding or injure the hands or clothing of anyone. The sides of the shelves are perfectly flush with the sides of the uprights. In addition, the shelving is **Fire-Resistant** and **Insect - Proof.** Simplicity of construction coupled with beauty of design fit this shelving to be used in the most elaborate libraries. A consultant staff of steel equipment experts is ready to co-operate with architects or building committees.

In addition to the library shelving, the regular steel storage shelving for general supply rooms is available, shelving that can be fitted into practically any space and set up without difficulty.

COUNTER HIGH FILING CABINETS



SECURITY STEEL Counter High Filing Cabinets effectively partition office space for reception of visitors and transaction of business. This equipment effects real economy. It conserves floor space and reduces work by keeping records immediately available. The cabinets can be equipped with individual or continuous tops covered with battleship linoleum bound with bronze binding. Files are equipped with bronze handles and label holders. The arrangement of this type of cabinet is almost unlimited.

STEEL SECTIONAL BOOKCASES

SECURITY STEEL Sectional Bookcases with receding glass doors protect treasured volumes in office or library. Doors will positively not wedge when moved back into cabinet. Bases and tops to match sections. Additional sections may be added any time.

LITERATURE AVAILABLE ON ALL LINES

DESKS AND TABLES

2 LINES—3 DIFFERENT LEG ARRANGEMENTS

PERIOD PRESIDENTIAL LINE

4 Legs

6 Legs

8 Legs

To an already comprehensive line, Security has added another amazing feature—4—6 and 8 leg arrangements. This means that all Security desks are tailor-made insofar as leg arrangement is concerned.

A new constructional feature—"Bridge Construction"—with all the rigidity and strength the term implies, adds to the long list of exclusive Security achievements.

All **Security Steel** desks are built to the rigid specifications of the Federal Specification Board of the Government.

THE NEW STANDARD LINE

The ideal desk for teachers, clerks, etc. The highest grade of commercial desk—available in many styles.

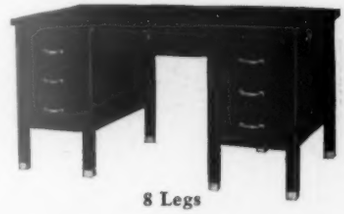
THE PERIOD PRESIDENTIAL LINE

Combining the charm of fine period furniture with the efficiency, economy and endurance of steel—a desk that will lend prestige to any university or school office.

STANDARD LINE

4 Legs

6 Legs



8 Legs

STORAGE CABINETS

For a thousand and one uses. Made in various sizes and styles, including counter and desk heights, to fit individual needs. Provides economical storage for advertising literature, office supplies, stationery, etc., and affords the most satisfactory means of keeping such materials away from dust and dirt.

PLANNED EQUIPMENT

Special SECURITY STEEL installations engineered by Security experts to fit individual needs. Federal, State and Municipal Governments, banks, public utilities, schools, universities and nationally and internationally known business concerns are profiting by Security Planned Equipment Service.

A complete survey of your particular equipment problem or assistance to architects and building committees will be made by our experts with no obligation.

WARDROBE CABINETS

A popular item for teachers. The center partition divides the cabinet into two compartments—one for storage and the other for wardrobe purposes. Complete privacy is assured.

MISCELLANEOUS ACCESSORIES

Many additional items of enduring SECURITY STEEL are available, even though not shown on these two pages. Write for information pertaining to products in which you are interested.

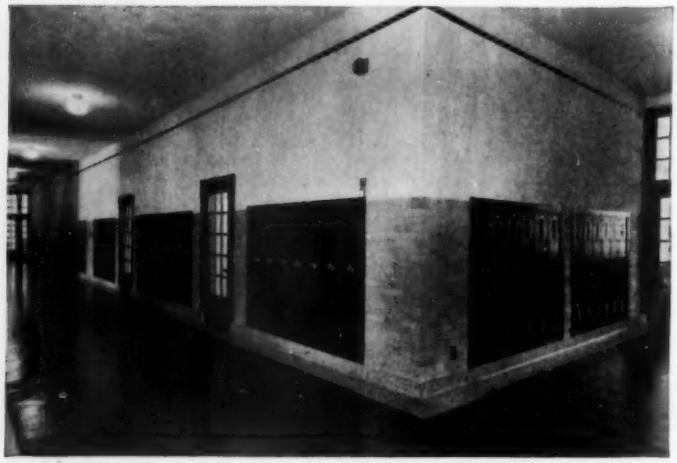
LITERATURE AVAILABLE ON ALL LINES

FRED MEDART MANUFACTURING CO.

3568 Dekalb St. St. Louis, Mo.

Manufacturers of

Steel Lockers—Steel Wardrobes (The Lockerobe)—Steel Shelving—Gymnasium Apparatus—Basketball Backstops—Telescopic Gym Seats—Playground Apparatus—Water Sports Equipment



STEEL LOCKERS

"Standard of Comparison," the title by which Medart Lockers are widely acknowledged both in the industry and among knowing buyers, is fittingly applied. . . . "Medart" has long served in the role of pioneer in the Locker manufacturing field and as a result, most of the details common in all lockers today first appeared as part of a Medart Locker. . . . All lockers are not alike. . . . In the current model, "Medart" includes a number of exclusive and desirable features that merit the careful consideration of the buyer. Compare!

Write for Locker Catalog L-6

STEEL WARDROBES

The Lockerobe

Space wasting cloakrooms and less efficient wardrobes are rapidly giving way to the modern thought in elementary school wardrobe equipment — The Medart Steel Lockerobe. Lockerobes require a recess depth of only 16 inches! One of the most important of the several functional advantages of Lockerobes, which is of special interest to school officials, is the system of simultaneous door control as provided by "Medart." Supervision of the wardrobe doors is reduced to a minimum. The teacher or a monitor quietly opens and closes all wardrobe doors by the simple operation of (1) one right-hand control door, and (2) one left-hand control door. Complete details upon application.

Write for Lockerobe Catalog LR-3

STEEL SHELVING

Books, classroom supplies, etc., are stocked better, inventoried quicker, and distributed faster when the storeroom is equipped with Medart Steel Shelving. . . . Easy to install, safe to use, and readily dismantled (all parts are interchangeable) for future rearrangements. . . . Medart Steel Shelving fully conforms to the exacting specifications of the Federal Government. . . . Complete engineering service available to interested parties without obligation. . . . "Let Medart lay out your stockroom equipment requirements."

Write for Shelving Catalog S-6

EAGLE LOCK CO.

Terryville, Conn.

General Sales Office: 26 Warren Street, New York, N. Y.

BRANCH OFFICES

521 Commerce Street
Philadelphia, Pa.

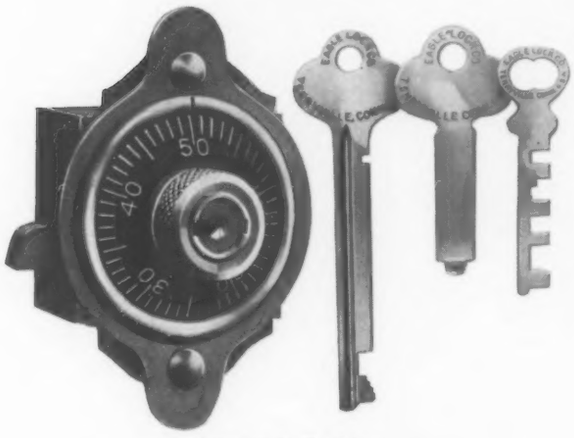
179 No. Franklin Street
Chicago, Ill.

114 Bedford Street
Boston, Mass.

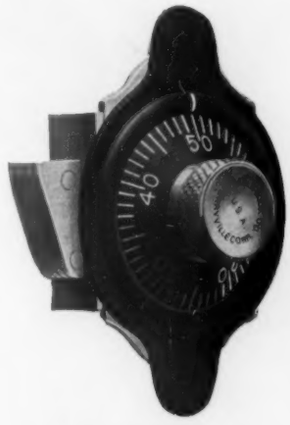
COMBINATION LOCKS

The maximum of economy and security.

Automatic Locking
Not furnished masterkeyed
Simplified dialing



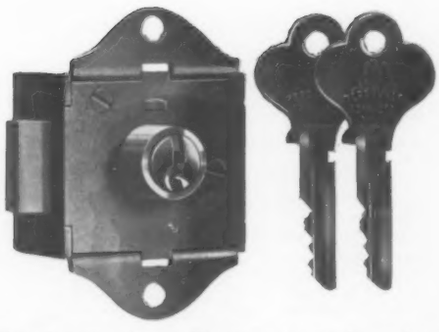
Automatic Locking
Change of combination is key-controlled
Furnished either masterkeyed or not



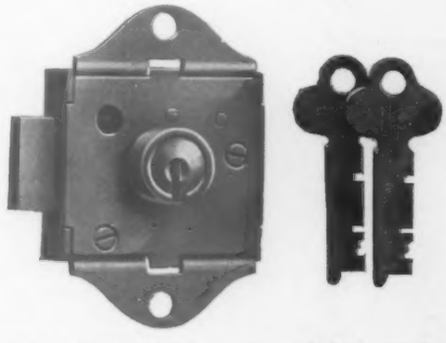
Automatic Locking
Not furnished masterkeyed

MANUALLY OPERATED KEY LOCKS

For use where greatest efficiency is requisite.



Pin Tumbler Construction—The type of work used in the most excellent grades of locks



Secure Lever Construction—A type of lock work that has proved its worth in years of service

Even under difficult space and light conditions the simple and positive operation of inserting and turning a key reduces delay to a minimum.

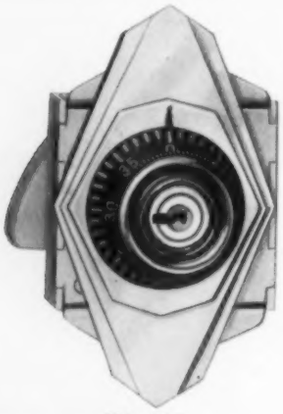
NATIONAL LOCK CO.

Rockford, Illinois

BRANCH OFFICES

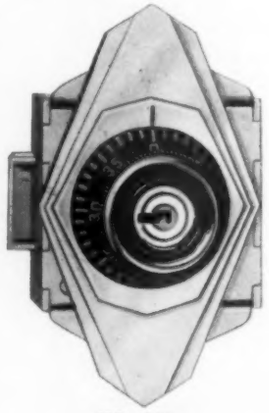
Chicago	Detroit	High Point, N. C.	Milwaukee	St. Paul
Chattanooga	Evansville	Indianapolis	New York	San Francisco
Cincinnati	Ft. Smith, Ark.	Jamestown	Portland	York, Pa.
Cleveland	Grand Rapids	Los Angeles	St. Louis	

ROCKFORD COMBINATION LOCKER LOCKS are available for standard Steel Lockers of any style or make. It is the complete line assuring the utmost in security, convenience, simplicity and durability. Rockford Locks have proven their worth in hundreds of Educational Institutions. For simplified and complete supervision and control select the Rockford Line.



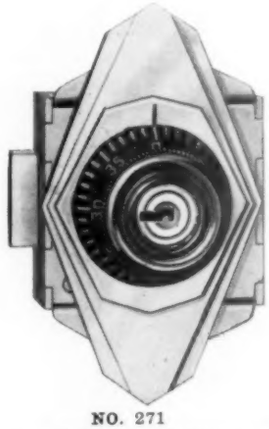
NO. 267

Master Keyed Combination Self Locking, for use on Lockers having spring latch bar. Over 64,000 different combinations available. No bolt or rivet heads visible from outside. Can also be furnished without Master Key feature.



NO. 269

For use on Box type Lockers having no latch bar. Lock has beveled spring bolt. Closing door locks lock and spins dial concealing last figure of combination. Furnished with Master Key feature.



NO. 271

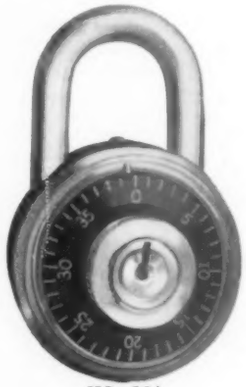
Master Keyed Combination Dead Bolt Lock having square end dead bolt. Lock does not have self-locking feature. Combinations of this lock and Nos. 267 and 269 can easily be changed by removing escutcheon plate and turning dial.

NO. 265

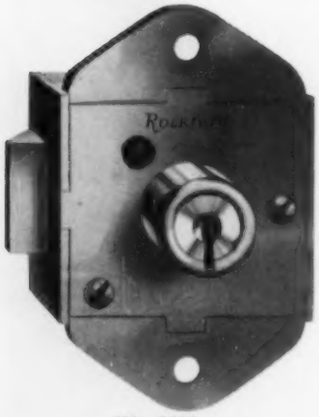
COMBINATION SHACKLE LOCKS

Keyless Combination Self-locking Shackle Lock that is fool proof, secure and durable. Inserting shackle upsets combination by turning dial. Must be completely re-dialed to open. Over 64,000 different combinations available. This is a very popular lock in the Rockford Line. Lock case is Chromium Plated and dial is black with white figures.

Master Keyed for ease and convenience of supervision. Can be Master Keyed with all built-in Locks shown above, or Laboratory Lock shown below. Students operate lock by combinations, while officials gain access by use of Master Key. Dial is locked against rotation when shackle is open.



NO. 264



NO. 2600

NO. 2600

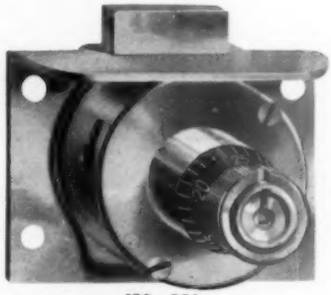
KEYED LOCKER LOCK

A manually operated Key Locker Lock of lever tumbler construction. Sturdily constructed of Steel and Brass. Over 15,000 possible key changes available. Can be Master Keyed if desired. Cylinder furnished in various lengths for heavy or light doors.

NO. 259

COMBINATION DRAWER LOCK

Combination Master Keyed Laboratory Drawer or Door Lock. Combination can quickly be changed without removing lock from mortise. Lock is of Solid Brass construction and is not affected by ordinary Laboratory fumes and acids. Lock is reversible for use on right or left hand doors.



NO. 259

Illustrated here are only a few of the many School Locks available in the Rockford Line. Ask for illustrated folder showing complete line.

THE YALE & TOWNE MFG. CO.

TRADE YALE MARK Stamford, Conn. TRADE YALE MARK

INTRODUCE true economies, maximum security and increased efficiency in locker rooms with these Yale Combination Locker Locks. They supply a degree of protection heretofore unavailable in locks of this type for locker use; security which discourages temptation, aiding in character development. Large easily read dials simplify operation, and minimize congestion and delay in locker rooms.

FOR ALL MAKES AND ALL TYPES OF STEEL LOCKERS

FOR NEW LOCKERS AND FOR REPLACEMENT OF WORN OUT LOCKS ON OLD EQUIPMENT

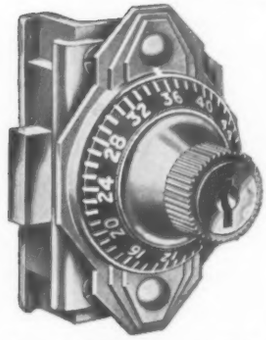
Exclusive Yale Features:

Maximum Security: Combinations dialed on three positive numbers. Combination must be known and cannot be located by manipulating dial.

Combination Disperser automatically upsets combination as lock is locked. A double safeguard. Acts as a defense against tampering.

Combination Changeable with every change of locker occupant—without removing lock from door. Feature secluded in back of lock in same secure manner as in Yale Bank Locks.

Supervisory Control of a group of lockers or the collective groups of a city school system obtained by the **Yale Emergency Key Control.** The key used is assigned exclusively to these locks.



For Lockers with Automatic Bolt Release Mechanism. Automatic Self-Locking Vertical Sliding Bolt. A New Locking Principle.

Emergency Key Controlled

No. L3374-CM, Cadmium finish
No. L3374-DZ, Chromium finish

Dial Operated Only

No. L3364-CM, Cadmium finish
No. L3364-DZ, Chromium finish

For Steel Compartment and Box Type Lockers. Beveled Spring-bolt, Automatic Self-Locking.

Dial Operated Only

No. L3369-CM, Cadmium finish
No. L3369-DZ, Chromium finish

Emergency Key Controlled

No. L3379-CM, Cadmium finish
No. L3379-DZ, Chromium finish

For Lockers with Gravity Type Locking Device. Dead Bolt Manually Operated.

Dial Operated Only

No. L3368-CM, Cadmium finish
No. L3368-DZ, Chromium finish

Emergency Key Controlled

No. L3378-CM, Cadmium finish
No. L3378-DZ, Chromium finish

NEW YALE COMBINATION PADLOCKS

FOR BASKET LOCKERS AND ALL OTHER TYPES AND MAKES OF STEEL LOCKERS

The finest and most secure combination padlocks yet produced

No. 589 Master-Key Controlled Dial

Same features of maximum security and automatic combination disperser as the above built-in type.

No. 579 Lock, Dial operation only.

No. 589 Lock, Dial operation with emergency key, provides supervisory control of lockers. May also be used with any of above built-in types under same control key.

These padlocks have ¼″ diameter steel shackles, Combinations unlimited.

No. 429 Lock, Dial operation only. A highly secure medium priced padlock. $\frac{9}{32}$″ diameter shackle. Combinations unlimited.

Above padlocks have Yale Visible Rotating Dial with forty-eight white graduations and numerals contrastingly indented upon black enamelled dial. Simplified operation. Faster, accurate dialing.

No. 429 Dial Operated Only

SECTION IX
CAFETERIA—HOME ECONOMICS—DORMITORY

HOME ECONOMICS ROOMS IN A LARGE CITY HIGH SCHOOL

By FRANCES L. SWAIN

Director of Household Arts, Chicago, Ill.

A MODERN home economics department must be equipped to deal with the various activities of homemaking education. This means that the foods laboratory must give opportunity to work with the preparation of meals in family quantities, to care for food in a sanitary and economical manner, to serve in a way which meets esthetic and social standards, and to make comparative studies in household procedures. The clothing room must not only provide machines and tables for clothing construction but must make adequate provision for the study of fabrics, the display of designs and models, and storage of collections of illustrative material. In connection with one of these rooms, or in adjacent space, there should be opportunity for simple laundry work, for use of equipment and demonstrations on home care of the sick, and for projects in planning, furnishing and caring for a home. In smaller communities these needs are happily met by providing a cottage which parallels the homes of the neighborhood. Many schools furnish a homelike apartment within the building, without becoming involved in the maintenance of a separate unit. Where neither of these plans is followed and the work must be carried on in the more traditional laboratory set-up, it is even more important to provide surroundings which give an atmosphere of friendly cooperation. In a large city system we are likely to find building plans worked out in terms of unit rooms which may be halved or doubled but not modified radically without getting into structural changes involving great expense. The problem is to utilize available space to give maximum flexibility in operation and at the same time secure the homelike atmosphere necessary as a background for successful teaching.

For the past ten years the high schools erected in Chicago have not included a housekeeping apartment, and in several of the older schools where these had been provided partitions have been torn out to provide additional space. While something may have been lost in the changed environment, the larger group has gained in experiences which had been artificially developed when the use and care of the apartment were separated from the daily activities of the whole class.

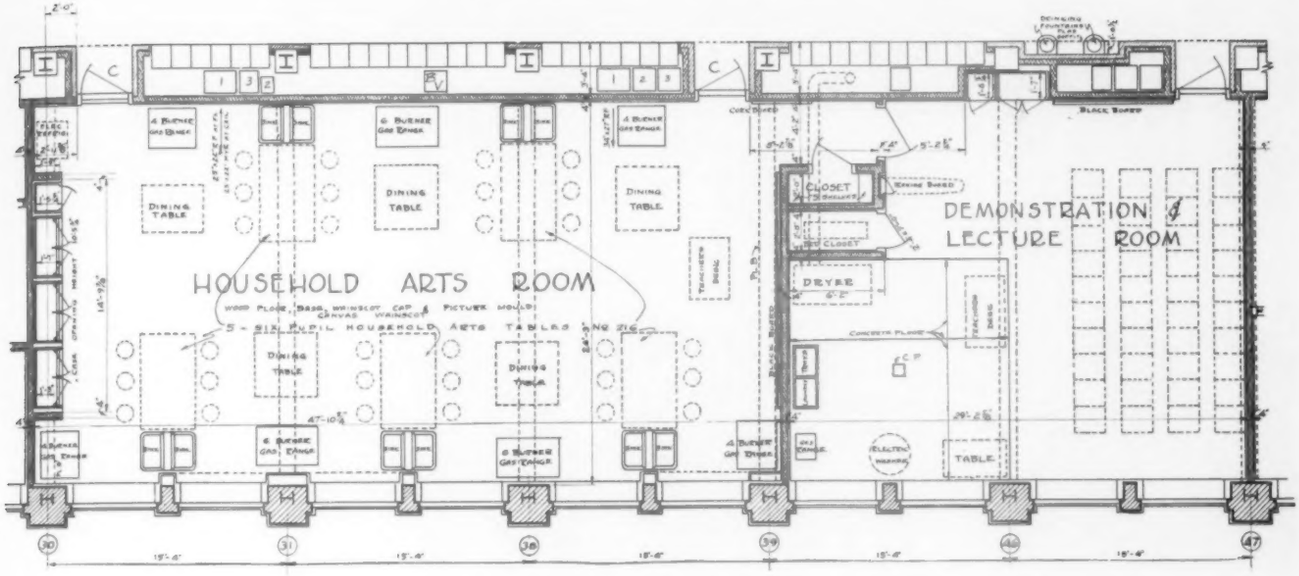
Foods Laboratories

For many years foods laboratories in Chicago followed the standard unit table plan, which provides for each four pupils a table, a stove and a sink. This arrangement has many advantages in that it enables the teacher to oversee the work of a large class and at the same time gives opportunity for work in family-size groups. For beginning classes, it offers a satisfactory and economical use of space.

In the Steinmetz High School, the newest in the city, plans have been modified to give an arrangement more nearly duplicating a home situation. Open rectangles are arranged as unit kitchens for group work, each with sink, stove, storage and working space and a table for serving and for conference.

Space is provided for 34 pupils. Where a class is smaller, the units planned for six may be used by four girls, and one of the corner units may be fitted up as library and work space.

Specially designed cabinets form the partitions which set off the unit kitchen. These cabinets furnish storage space for utensils and for staple supplies. The working surface is covered with linoleum, which has proved very satisfactory. Individual stools of suitable heights give an opportunity to establish good

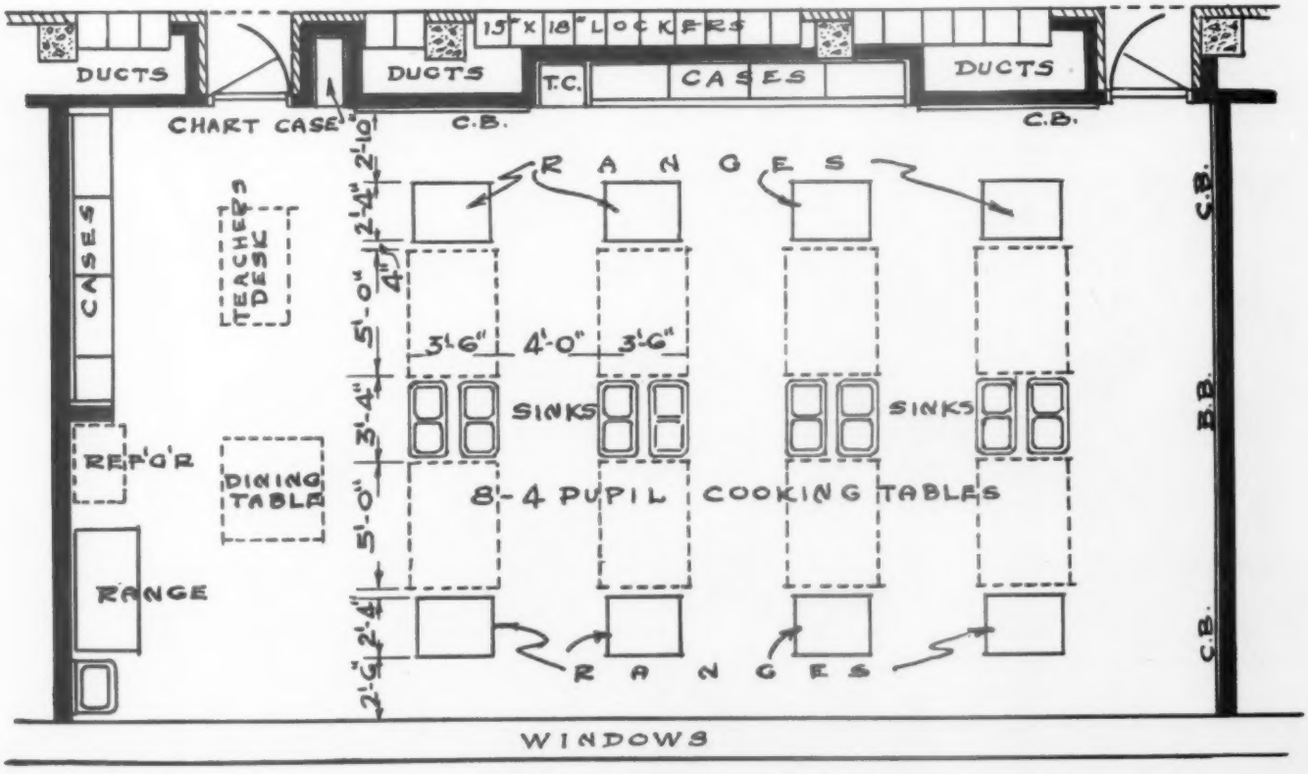


Plan 1—Household arts room suite

working habits. With this arrangement, the teacher can be in touch with the whole class and yet the members of each group find themselves in a situation similar to a home experience. This helps to meet the criticism that what is done in a school laboratory is so far removed from home practice that no carry-over is made.

Stoves for these unit kitchens have well-insulated ovens with heat-control devices. Pupils have the experience of entire responsibility for their products. The tops have either four or six burners.

Each unit is supplied with a table. This is used as a dining table for the informal service of the group, and as a library or study table during recitation periods. When necessary to serve a large group, the tables can be fitted together to furnish ample space.



Plan 2—Foods laboratory in a room 24' 0" x 45' 0"

A library corner is a useful adjunct to the homemaking rooms

Cabinets across the back of the room provide storage space for large utensils and those which are less often in use, as well as for additional food supplies. A case with a long rod and hangers cares for the aprons of the pupils. An electric refrigerator has been installed which removes the necessity for drain pipes and enables the class to learn the care and operation of this piece of equipment, which is common in the homes of the neighborhood.

Ample blackboard space across one end of the room is provided with a rod and pins from which posters and illustrative material may be suspended. Additional surface for display is furnished by a cork bulletin board and by cork-board insets in cabinet doors.

The clear space in the center of the room provides for getting the whole class together for discussion.

Classroom

Adjoining the foods laboratory is a room which can be used for regular class periods either for a home economics class or for other groups in the school.

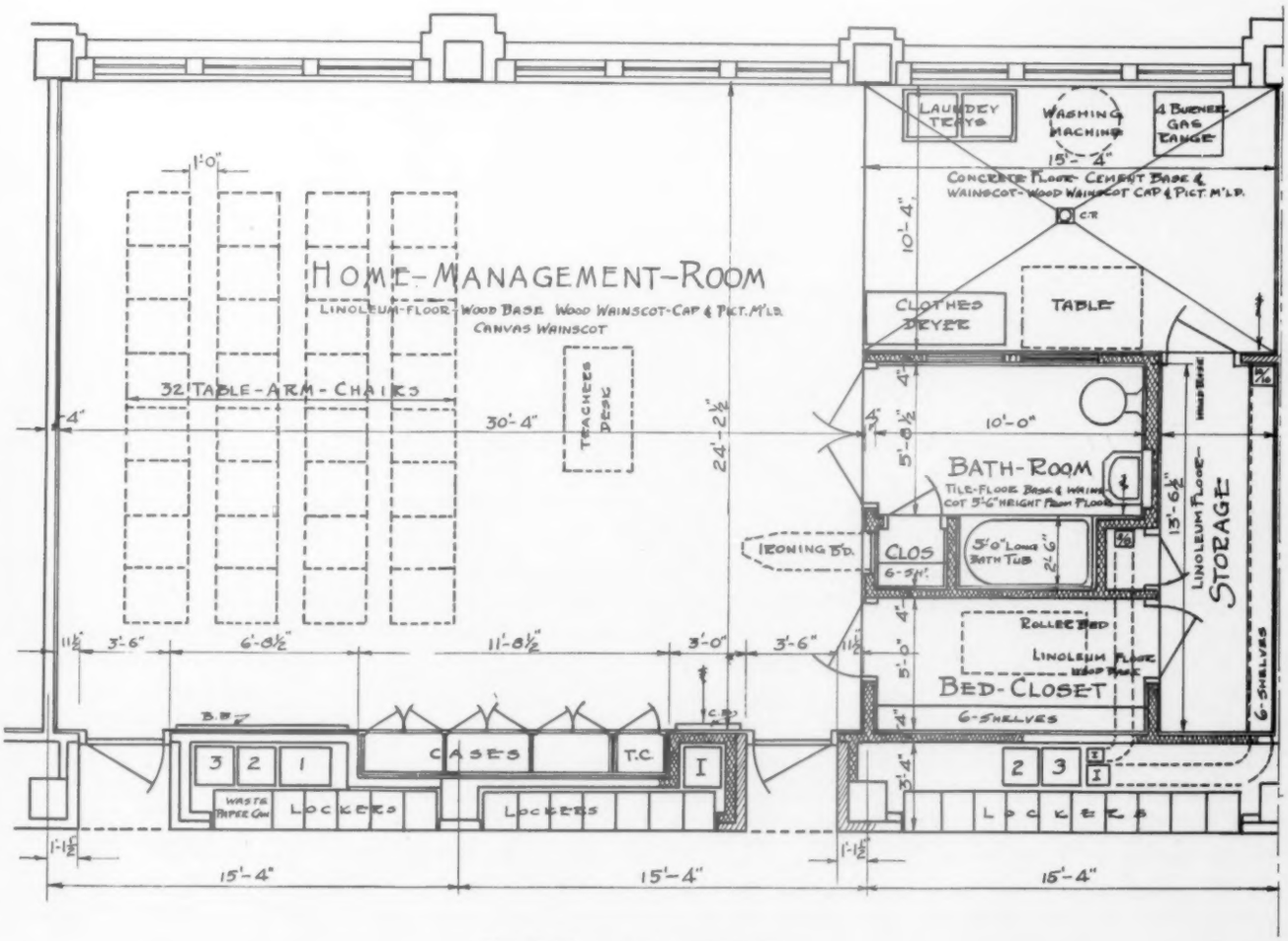
Class at work in a unit kitchen

This is an advantage in program making. Equipment for use in the homemaking class is installed in the front of the room, and by providing this in closets or a screened alcove the plan is flexible enough to adjust to various phases of the work and yet leave a room which is useful for general purposes. One corner may be fitted up for a laundry unit with the necessary equipment of tubs, dryer, washing machine and mangle, as well as table space. Screens make it possible to conceal these articles when not in use. If the program of the school does not call for this type of work, the space is useful as a library unit with shelves and a table or two. In some schools this space could provide a corner for demonstration and practice for the home furnishing units. On the opposite page students are shown working in a library corner next to the unit kitchens.

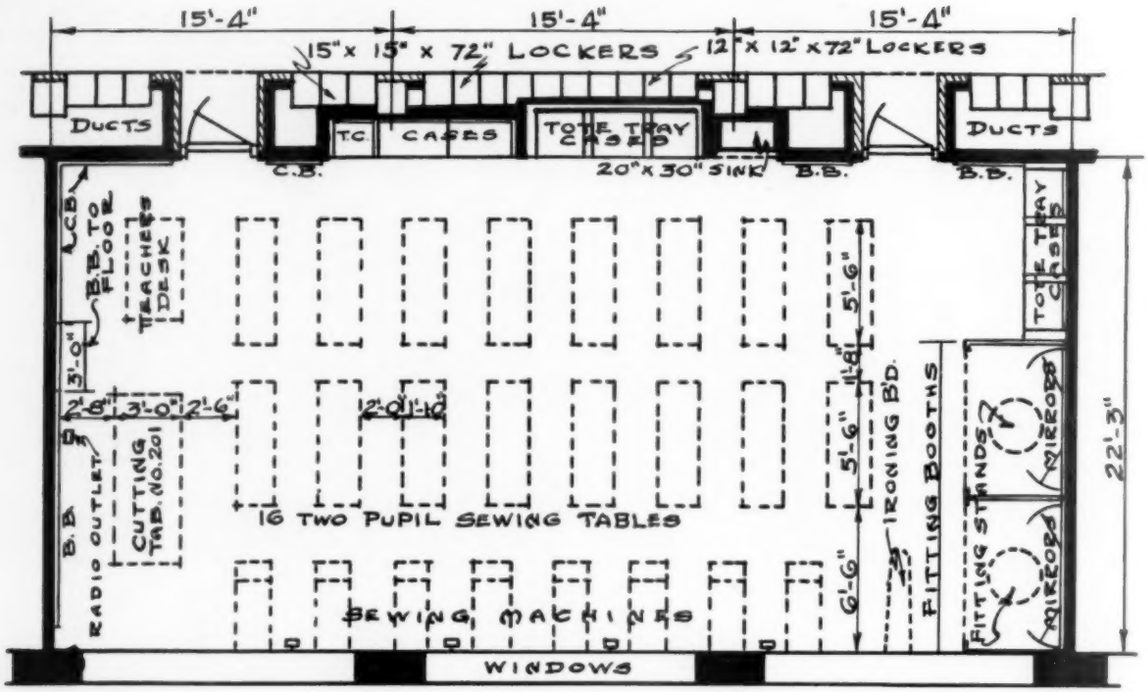
When the rollaway bed is brought out from the closet, the room is ready for the home nursing class to practice their work with a patient, or for the home management class to make a study of bedmaking. When not in use, the bed is out of the way and does not require care as in the case of a bedroom in the usual school apartment. The closet which occupies the remaining space between foods laboratory and recitation room may be used in studying closet arrangements and is valuable for storage. Bookcases and cabinets are installed in the inner wall, and corkboard inserts in the doors of these provide extra bulletin space. In a large technical high school which is soon to be erected, a similar arrangement will be used in planning the home management room. (See Plan 3.) For this school a bathroom will be added, and a movable partition will be used to shut off the laundry unit when not in use. An extra storage closet is secured by utilizing space at the rear of the bathroom and bed unit.

Clothing Laboratory

It is highly desirable that the clothing room be near the one used by foods classes. While good lighting is important for all classrooms, it is an essential in a clothing laboratory. In addition to the general lighting, there should be drop lights supplied with daylight bulbs and low enough to be of use to those working at the tables.



Plan 3—Home management room



Plan 4—Clothing room

Two-pupil tables enable the whole class to face the teacher or the member of the class who may be conducting a discussion. These tables are covered with dark linoleum, which prevents glare and offers a good working surface.

Tables are provided with open compartments on either side which care for books and sewing trays while pupils are at work. These trays or open boxes of metal for pupils' work are stored in cases at the rear of the room. Boxes for one class occupy a section which can be locked at the close of the period. The plan calls for a box for each girl, but when classes are crowded pupils may be asked to share.

One case at the rear of the room has a glass front and is used for the display of finished work. Another case is fitted with rod and hangers to provide space for garments in process of construction.

A sink and basin are provided for use in alteration work and the testing of fabrics.

A large cutting table is available when individual table room is inadequate.

A fitting room is installed in a corner where the light is good. This is provided with a triplicate mirror and a fitting stand of wood to match the trim of the room. This corner is shut off by monk's cloth curtains hung from rods. The curtains can be drawn back and the corner thrown into the room when it is not in use as a fitting room. If desired, three-fold screens attached to either wall can be drawn to form a room or shut back out of the way against the wall.

Blackboard space at the front of the room is provided with rod and pins for hanging cuts and other illustrative material. An equal space is fitted with cork board, and inserts of cork board in the doors of the cabinets provide additional space for the display of helpful pictures and clippings.

Homelike Atmosphere Through Artistic Touches

Electric outlets are provided for irons and for machines. It is highly desirable that clothing rooms be provided with some electric sewing machines, since these are in such common use in homes at present. However, a girl who learns to sew on a foot-power machine has nothing to unlearn when she begins to use an electric machine, and the added element of novelty and danger in the electric control is sometimes a handicap. It is wise to have both types of machines, so that pupils may become familiar with their use.

The above plans give the framework for the work of a home economics department. To this must be added the artistic touches which contribute to a homelike atmosphere. Pictures, textiles, and bowls for simple flower arrangements, help to provide a satisfying background, and their selection and disposition are desirable learning activities. Cabinets and filing cases make it possible to care for materials efficiently and in doing so to give the pupils experience in systematic housekeeping.

If the desired ideals and standards for homemaking are to be developed, the rooms in which the pupils spend their time must be both convenient and artistic, as consistent with the teaching of the class work.

HOUSEKEEPING AS AN ADMINISTRATIVE PROBLEM

By ROSALIE S. GODFREY

**Business Director of Residence Halls,
The University of Texas**

WITH the growing tendency of colleges and universities to establish residence halls on a self-supporting, self-replacing basis and to set standards of living by means of them, it has become necessary for the care of these buildings, as well as the food service and business management, to be under the supervision of trained persons. Many educational centers, through their home economics departments, in some cases aided by members of the Executive Housekeepers' Association, are training persons to fill such positions.

Dormitory standards of a few years ago were low indeed. The buildings and living quarters were unattractive, poorly cared for and uncomfortably furnished. Now, in many dormitories, including low-priced ones, comfort and good standards prevail. The policy of better and more attractive buildings and furnishings demands that time and thought be spent on their selection and care.

Perhaps there is no greater waste at the present time than that incident to the care of public buildings. It is much more economical to care for furniture, furnishings, walls and floors, than to replace them. The maintenance of many beautiful and expensive public buildings is dependent upon untrained janitors, who through ignorance and excessive and inappropriate use of cleaning materials render an otherwise beautiful building offensive to the users.

Selection of Finishes and Furnishings

The first factor in the maintenance of residence halls is the careful selection of interior finishes, furniture and furnishings. All furniture, fabrics, wall surfaces and floors should be selected from the standpoint of the uses to which they are to be put. Spaces occupied by the public, represented in this instance by students, must be more durably planned than residences, because (1) they are used by many more people during a given time, (2) people take more care of their own property or that of friends than when the ownership is intangible, and (3) many kinds of people with varying standards of living use them.

Selection of durable upholstery fabrics is essential because a vast amount of time and money is required in re-upholstering, and a surprisingly large percentage of this cost is labor. Ofttimes, if the original fabric costs a little more, it may still be cheaper in the end because it wears longer and saves the cost of labor in re-upholstering by lengthening the span between such operations.

The first thing to consider when planning the interior of residence halls is the amount of money available. The purchaser should be sure that, for the money available and for the use to be made of the space, the best interior surfaces, furnishings and furniture are secured. In some instances it is desirable to sacrifice durability for appearance; for example, a large room is unattractive if all the lounge chairs have exposed wood arms. If the operating budget permits, a few chairs with overstuffed arms will relieve this a great deal. In such cases, very careful selection of fabrics must be made in order that the overstuffed pieces may not soon appear frayed and soiled, requiring an expense of time and money to replace.

Lounge rooms and public rooms in residence halls, because of their size, use and supervision, are more permanently furnished than is usually the case in student bedrooms. In the case of bedrooms occupied by students, it is often economy to use fairly inexpensive rugs, upholstery, bedspreads and draperies, in order that every few years the rooms may be freshened up for the next occupant. Midnight spreads, spilled ink, and the general use to which a room is subjected by students, present quite a problem for the director who attempts to keep the rooms appearing fresh to each new occupant. What landlord has not discovered the expense incidental to the change of renters? Walls that did not look dingy with the last family appear impossible as he thinks of offering his property to another.

Nothing lessens the feeling of responsibility of an occupant for rented space so much as run-down-at-the-heel property. Experience shows that the public in general naturally take more care of property in good condition. Students in classrooms hesitate to be the first to deface a tablet armchair, but after the first defacing, initials and pictures appear in rapid succession, unless the chair is removed and repaired at once. Hotel guests are much more apt to polish their shoes with a dingy towel found in an ill-kept bathroom, than with a snowy-white one in a room where the plumbing is in good order.

In residence halls a feeling of pride can be developed among the students for well-kept houses. This, besides aiding in the care of the building, is

unconsciously educational from the students' standpoint, and is a part of the education which a student gains from other than books while at the university. If rooms are well cared for and responsibility for them can be placed, carelessness is easily detected. The deductions made from a student's deposit for careless use of the room are more easily accepted by him if the room is kept in such good condition that the damage is perceptible even to the careless student.

In residence halls, when the budget permits, all bedding should be furnished and beds made by the management. This insures the best care of mattresses, pillows and springs, the detection of vermin, and the comfort of the student. The minimum to be furnished includes bed-pads, sheets and pillow-cases. The minimum service to be given is the weekly making of beds, which includes the turning of the mattresses, and the placing of two clean sheets and a clean pillow-case on each bed.

Methods

The second factor in the care of residence halls is the establishment of suitable methods. This includes the selection of the cleaning outfits and directions for using them, and the development of employees' schedules.

In an organization such as the one at the University of Texas, where there are eight residence halls, the work is unified and simplified if the cleaning outfits, methods and policies are standardized whenever possible. Better prices are procured because of the quantity to be purchased, each building has the benefit of the experiences of all housekeepers and directors, new and unfamiliar materials can be tried out uniformly, and the workers can be shifted from one building to another—an advantage both to the employer and to the employee.

The cleaning outfit is divided into equipment, hand tools and supplies. Classed as cleaning equipment are the large cleaning pieces which have permanency and represent a fairly large investment, as vacuum cleaners, electric waxers, electric scrubbers and maids' carts. Because of their construction, material, durability and specialization of the work done by them, they represent the most expensive items found in the cleaning outfit.

Under the heading of hand tools are the smaller cleaning pieces which represent less of an investment, are less clumsy to handle and are replaced at irregular and frequent intervals, as brushes, mops, brooms, squeegees and pails.

Classed as supplies are the materials which are used up in their operation, as soaps, detergents, wax, cleaning powders and disinfectants.

The standardization of cleaning equipment, hand tools and supplies for a given building or group of buildings, is dependent upon the type of the buildings, the surface to be cared for, and the type of workers. The essential, common to all set-ups, is that each worker shall have a separate cleaning closet equipped with such articles as are needed, and shall be held responsible for their care and use.

The workers should be trained in the use and care of all equipment and tools and in the use of the various supplies with which they come in contact. All cleaning supplies should be kept in locked storerooms and issued at stated times to the workers. Those issued to maids and porters should be foolproof. Strong acids and alkalis should be used only under the specific direction and supervision of the housekeeper. If this rule were more generally observed, much damage to painted surfaces, marble, floors and fabrics, as well as casualties to employees, would be eliminated.

A working schedule should be given to each employee. These schedules should show the duties and working hours for each day of the week, and should include meal hours, days and time off, the space to be covered by the worker, and the approximate time in which the various duties are to be performed.

Selection of Employees

The third factor is selection of employees. It is obvious that the porter who could satisfactorily scrub a concrete corridor in the basement might not be a satisfactory person to care for the hardwood floors in the lounge. Workers should be selected for specific jobs. They should be teachable, neat in appearance, suitable in size for their job, quick and easy-motioned, and should possess a pleasing personality. Their previous positions and past experience should be carefully considered. An inexperienced person who is teachable is far better than one who has been trained in careless methods, for much damage can be done by a careless worker. To untrain and retrain is usually more difficult than to train originally.

Training Employees

The fourth factor is training employees to use the equipment and methods furnished by the housekeeper. Since all interested workers have something to contribute, the housekeeper should be alert to suggestions made by the workers and, when practical, incorporate them into the recognized methods. Intelligent workers appreciate having reasons as well as methods explained to them. All new workers should be closely supervised, to enable the housekeeper to determine their characteristics and limitations, as well as to help the worker to do what is expected of him.

The new employee gains a lasting impression of the organization through the treatment he receives the first day from the staff and his co-workers.

THE SELECTION AND MAINTENANCE OF CHINAWARE

By EDWARD SCHRAMM

Research Laboratory, Onondaga Pottery Company

THE selection of tableware, whether for use in the household or in public eating places, should be considered from the three viewpoints of serviceability, durability, and beauty.

Selection for Serviceability

The question of appearance is likely to occupy first place in the mind of the home buyer. Service conditions are usually less severe in household use, and consequently a great variety of wares is available, which may be classified as earthenware, semi-vitreous ware or semi-porcelain, true china and true porcelain. The first two classes are porous wares, and are unsuited for public use. All three basic requirements can be met by completely vitrified (non-absorbent) true porcelain and true china wares fired to high temperatures.

Serviceability includes such items as heat-retaining capacity and the maintenance of a sanitary condition which are inherent in the vitrified body because of high density and complete impermeability. It also includes consideration of the shape and design of the ware in relation to the intended use. In many instances this becomes the controlling factor. For example, restricted table space or the need to make the best use of cafeteria trays may dictate the adoption of the newer narrow-rim plates, which are markedly space-saving in comparison with the conventional style.

Selection for Durability

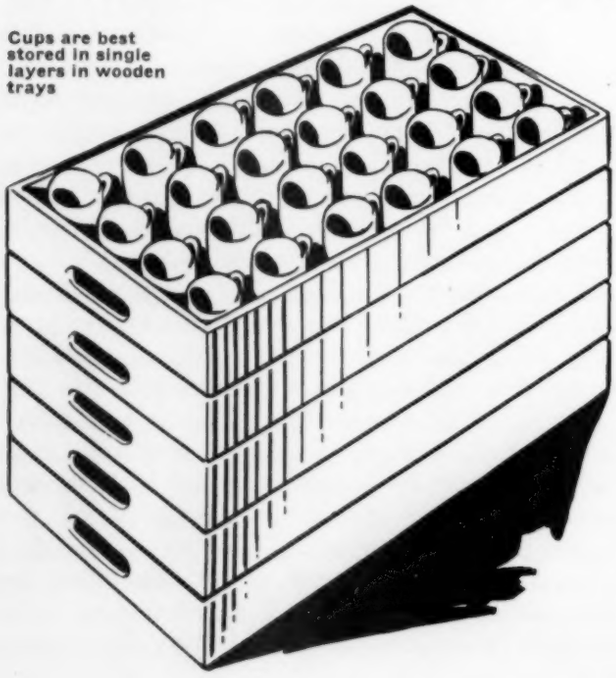
Durability depends on the technical qualities of the ware, but is also influenced by design and shape. Extensive tests by the Bureau of Standards show that well-made American hotel china excels any other ware in resistance to chipping and breaking. This very ruggedness has introduced other problems which will be discussed later. Naturally, the heavier the ware, the more rough handling it will stand. However, there is a limitation in this direction, fixed not only by the awkward appearance of over-heavy ware, but also by the tendency of heavy pieces to abrade more rapidly the glaze surface of the ware with which they come in contact. Likewise, beyond a certain point increase in weight is of doubtful utility, since the blows sustained in handling are increased in magnitude along with the ability of the ware to endure such blows. Many years' experience has shown the standard-weight rolled-edge ware, or the equivalent-weight narrow-rim ware with rolled edge, to embody a high degree of all-around durability. In services where careful handling and good care can be assured, medium-weight ware may be used to advantage. In some instances, thin household tableware is used in public eating places, but this practice is not to be generally recommended. Rolled-edge ware (that is, ware with an edge thickened and rounded on the underside) is more resistant to chipping than ware with a plain edge, but when chipping does occur, it is better to have the chip on the back rather than the face of the piece. This is effected by making plates with a carefully designed roll and with a flat rather than a steep-pitched rim. Finally, it should be borne in mind that for maximum durability the entire service should correspond in weight and design. Light-weight ware cannot be expected to stand up well when mixed with heavy, unless given special care. For example, light-weight cups, so desirable from the standpoint of the patron, require good care when used in conjunction with a heavy service.

Durability includes the maintenance of surface condition, both glaze and decoration, as well as the avoidance of breakage. The glazes on high-fired porcelain and American china wares are extremely hard, in fact, harder than cutlery, so that they cannot readily be scratched by a knife. Mechanical glaze abrasion is chiefly due to rubbing or impact of ware on ware. All makes of tableware are subject to this effect, just as a diamond can scratch a diamond.

Foreign porcelain and American high-fired china are made by different methods, each of which has its advantages and disadvantages. In the process of producing the foreign true porcelain, the glaze is fired at a very high temperature and developed along with the body. In the process of producing American high-fired china, the body is fired alone and the glaze developed in a second fire at a somewhat lower temperature. The European method produces a slightly harder glaze, but all pieces must rest on the foot during firing. This requires that all glaze be removed from the foot, so that the true porcelain ware is handicapped in service by the abrasive action of the exposed foot, which is harder than the glaze itself and frequently rough. The essential need is that the glaze be hard enough to resist cutlery scratching, a requirement met by the glazes on all American type china, but not by all earthenware and low-fired china glazes.

The abrasion due to rubbing or impact of ware on ware can be avoided by proper care in handling. The problem is one of maintenance rather than selection, and will be further discussed below.

Durability with respect to decoration is assured by the exclusive use of the underglaze process. Most American hotel and restaurant china is so decorated. On the other hand, imported wares intended for hotel use are not so decorated, as the method of manufacture does not lend itself to the underglaze process. Most thin household ware is decorated overglaze. Well-fired overglaze colors are adequate for this service, but generally unequal to the more severe demands of restaurant use. Overglaze decorations are developed in a special fire at comparatively low temperature. They are subject in use to mechanical wearing-off, and to chemical attack by acids in foods or by alkalis in washing compounds. Dark blues are likely to be especially sensitive. Decorations in gold and platinum are a special case. These can only be done overglaze, and indefinite life can never be guaranteed. The relative durability of such decorations will vary greatly with the quality of the work. The best banding is done with paste or burnish gold, a suspension of finely powdered solid gold in suitable oils. A heavy gold layer is thus applied, and the durability can be improved by the inclusion of suitable fluxes and alloying metals. Cheaper work is done with bright gold or liquid gold, a solution of gold in certain oils, which is applied very thinly, and comes out of the kiln in a bright state which requires no burnishing. The difference in quality of the two styles of work has nothing to do with the purity of gold; in fact, bright gold after firing has normally a higher percentage of pure gold than good burnish work. The chief reason for the poor durability of cheap gold work is the extreme thinness of the layer applied.



Cups are best stored in single layers in wooden trays

Selection for Beauty

Restaurant china is available in a number of different colored bodies and in a great variety of decorative treatments. Often the choice is determined by the personal taste of the buyer. Sometimes the motif is chosen because of a peculiar fitness; for example, the reproduction of a college seal in appropriate colors. In some cases the decorative treatment of the china is adapted to harmonize with the surroundings. China manufacturers seek to advance the esthetic appeal of their product and to keep in touch with modern standards of taste. To further this aim, they have added to the standard white ware, colored bodies chiefly in ivory and buff which lend a warm tone and furnish an excellent background for other colors. A great variety of underglaze decorative treatments is available. These include the following:

(a) Simple line and band work.
(b) Prints in one or occasionally two colors from engraved plates, ranging from simple crests to elaborate patterns with delicate shading.
(c) Decalcomania (decal.) patterns in many colors.
(d) Hand-painted treatments.
(e) Solid color decoration.

Sometimes a combination of methods is required to produce an effect; for example, combinations of line and decal. work, line and print, solid color and hand painting, solid color and line.

To Avoid Breakage

Traditionally, china as used in the household is regarded as a fragile and precious article and handled as such. In contrast, the ware used in institutions is remarkably rugged. This great strength often tempts the user to handle it very roughly because the ware can "take it." The result is cumulative damage in the way of chipping and marring of the glaze. Just a fraction of the care given to domestic china will yield a substantial return by maintaining the original lustrous appearance of the ware through years of service.

The avoidance of breakage is a matter of simple common sense. A frequent cause is found in poorly organized methods of handling and storing ware. The price of confusion is high, and adequate and convenient storage facilities are indispensable. A few rules should be observed. Two pieces of ware should not be struck together with a sharp blow. Do not stack ware too high; avoid the nesting of cups, a practice which results in handle and other breakage. Cups are best stored in single layers in wooden trays.

The Maintenance of Glaze

The maintenance of appearance is fully as important as the prevention of mechanical losses, and more difficult to achieve. Overglaze decorations may not stand up, but, as previously pointed out, it is not necessary to use decorations of this type, and the underglaze patterns are indestructible.

A slight porosity of the body, even when well glazed, will lead to absorption of grease and other impurities, producing eventually a spotted or mottled appearance. The remedy is to insist on completely vitrified ware. Good restaurant ware should have a water absorption of not more than $\frac{1}{10}$ of 1 per cent. The porosity may be tested by placing a drop of ink on the exposed fracture of a broken piece, allowing it to dry and washing it off with water and a damp cloth. If the body is porous, a pronounced stain will remain.

Maintenance of glaze appearance requires good care. Glaze failures are caused in two ways—by mechanical and chemical action. The mechanical failures are the result either of impact or of abrasion. Both kinds can be minimized by proper handling. Ware should not be allowed to strike against itself violently, and no washing machine should be used in which such action occurs. Abrasion or scratching is produced when one piece is rubbed across another under a certain amount of pressure. When plates are piled too high and moved about, very heavy pressures are exerted, so that it is best to restrict the height of stacks. Damage can also be done by improper methods of stacking. When plates are thrown or slid together, there is danger of producing scratches or dull, rubbed markings. The proper method of building up a stack is gently to place the rim of a plate on that of the plate below and gently to let the upper plate fall into place. In cleaning ware, harsh scouring powders should never be used.

A scratched or abraded glaze provides a surface which holds dirt and makes the glaze more liable to discoloration and to attack by chemicals. Careful handling, therefore, helps to prevent the chemical as well as the mechanical attack on glazes. One type of discoloration is caused by metal marking. This is due to rubbing of the ware against metal, which leaves a streak that is difficult to remove. The soft metals, aluminum and zinc, are the most harmful. Nickel, nickel plate, monel metal, good grades of stainless steel, chromium plate, may be comparatively harmless. The best solution is to keep the china from contact with metal as much as possible. For cafeteria service composition trays should be used.

Washing—Rinsing

Chemical effects to consider include formation of lime scale, deposition of mineral sediment from waters, formation of adherent food stains, and etching of the glaze. These difficulties may be combated from two directions: (a) through proper control of the conditions under which the ware is washed, rinsed and dried; and (b) by using the best washing powder obtainable. Under (a) the important items to consider are:

(1) *Nature of Water Supply.*—Very hard waters tend rapidly to build lime scale. The installation of a water softener is probably the best solution of this problem. Much smaller quantities of washing powders are then adequate and, in addition to the resulting improved appearance of the ware, the reduction in cost of washing powders may be considerable. Cloudy water will leave sediment on the ware, and such water should be clarified before use.

(2) *Temperature of Washing Solutions.*—Extreme temperature should be avoided, since it promotes the formation of lime scale and increases the tendency of the washing solution to attack the glaze; 150° F. may be considered a suitable working temperature.

(3) *Rinsing Conditions.*—Copious rinsing is indispensable, and the ware must not be permitted to dry between the washing and rinsing operations. Thoroughly draining rinse water from the ware is important. A steam "spray" at the discharge end of the washing machine is effective in removing rinse water and facilitating drying.

(4) *Concentration of Washing Compound.*—With any compound, an excessive amount may damage the glaze. The quantity needed depends on the nature of the water, but as a rule $\frac{1}{4}$ to $\frac{1}{2}$ per cent is sufficient; that is, $\frac{1}{3}$- to $\frac{2}{3}$-ounce per gallon of water.

Ordinarily, washing conditions are not ideal, so that our general item (b), the selection of the best washing powder, becomes practically of the greatest impor-

tance. The washing operation must be so carried out that the following conditions are met:

(1) Grease must be dissolved and removed.

(2) Solid dirt must be suspended and carried off.

(3) The solution must not deposit lime scale or other sediment on the ware.

(4) The washing solution must rinse off freely, leaving no residue behind.

(5) The solution must not have any appreciable tendency to attack the glaze.

Before the advent of the washing machine, the above conditions were best met by the use of a neutral soap. The use of soap is impossible in machines because of the frothing action, so that the use of mineral cleaners has become universal.

The first mineral cleaner used was common washing soda. This caused formation of hard lime scale and had a rather inefficient cleansing action unless used in excessive amount. The use of tri-sodium phosphate marked an advance, but there was still difficulty with lime sediment. Some forms of silicate of soda were found to be very efficient cleaners, but their use alone led to various troubles. Compounds have now been developed which entirely prevent the lime from settling out. Some of these in addition contain "wetting" agents which improve rinsing action. These improved compounds sell at somewhat higher prices, but improved maintenance of the china will more than pay the added cost. Trade names of some satisfactory cleaners are as follows:

Calgonite	Calgon, Inc.
Laxal 60	J. H. Weidman
Lightning K. O. L.	Du Bois Soap Co.
Keego	J. B. Ford Co.

Ware is sometimes discolored by overheating on hot plates or in improperly regulated heating ovens. Fat or other food material thus burnt on may be impossible to remove. Plates can be warmed to moderate temperature in suitable warming ovens without incurring this danger. Tea or coffee allowed to remain on the ware until it has evaporated and dried, may leave a stain which is difficult, but not impossible, to remove. The safest method for the removal of stain caused by food or beverages, is through the use of weak hypochlorite solutions. Common bleaching powder (calcium hypochlorite) may be used, but sodium hypochlorite is more effective and convenient. It can be obtained in the form of a solution or in powder form, and in either case is to be suitably diluted with water. The hypochlorite solutions must be kept out of contact with metal; stoneware or enameled containers should be used and rubber gloves worn for handling. This treatment is for occasional use only; the frequency will be determined by local conditions. Where for some reason the hypochlorite treatment cannot be applied, the ware should be washed and wiped by hand at regular intervals, using, but only if necessary, a soft powder such as Bon Ami to assist in removal of film.

The hypochlorite treatment also kills all bacteria and is therefore an excellent thing from a sanitary standpoint. Recent medical investigations have shown that a minute amount of chlorine used regularly in the rinse water will maintain the dishes in a perfectly sterile condition. We are not aware that this practice is anywhere in effect today, but it appears the next logical step in the maintenance of china in public eating places.

Mineral sediments which do not respond to the hypochlorite treatment can sometimes be removed directly by Bon Ami, but in extreme cases it is necessary to soak the ware in weak acid such as vinegar or a 5 per cent hydrochloric acid solution. Following the acid soak, a gentle scouring with Bon Ami powder will remove the sediment.

Summary

To summarize, the main items in the proper care of china are:

(1) Careful handling; avoid as much as possible striking, rubbing or sliding pieces against one another.

(2) Provide adequate, convenient, and well-organized storage.

(3) Use soft water if possible.

(4) Use mild washing powders, and no more than needed.

(5) Use washing powders of best quality, avoiding especially powders which form lime scale.

(6) Rinse ware thoroughly and drain off the rinse water.

(7) If film does form on ware, remove periodically either by sodium hypochlorite treatment or hand washing.

(8) Avoid heating wash water above 150° F.

(9) Avoid contact with soft metal, such as aluminum or zinc.

(10) Avoid overheating ware on hot plates or in ovens.

THE STUDENT UNION

Part I—General Principles of Design and Operation

By PAUL B. HARTENSTEIN

Director, Houston Hall, University of Pennsylvania; Secretary, Association of College Unions

ANY description of a student union must begin with a definition. In its broadest aspects a student union is a recreational building dedicated to the social welfare of the student body it serves. In addition to having facilities for purely social and recreational activities, it must also be equipped to provide the many services that a student requires. Both as a recreational and a service building it should be the vibrant center of all undergraduate extra-curricular activity.

That this definition is nothing more than a generalization must be obvious. It is a fact, however, that student unions are as different as the individual members representing their organizations and, even though they are created by the same common need for a student social center, each union building has, because of its time of establishment, its college traditions, its environment and its physical limitations, developed into a highly individualistic institution.

What Facilities Should the Union Provide?

In the planning of any student union building it is essential that the needs of the student body at the particular institution be studied painstakingly, with an intelligent attitude toward the already existing facilities, so that the maximum number of services and the maximum amount of recreational opportunities can be offered to the student body of the university which the union is to serve. This is the primary requisite in approaching the problem of a suitable design for such a building. To illustrate this point, let us assume that at a major Eastern institution a new student union is to be constructed. The institution has an excellent swimming pool, a splendid theater, and also a building devoted to the publication offices. Obviously, it would be a desirable thing if these features could be incorporated in a student union, but to duplicate them would be both expensive and unnecessary. It is for such reasons that it is impossible to suggest any standard design for a student union building.

Although there is no formula for a complete student union, a study of the facilities available in a large number of student unions indicates that certain service units are universally recognized as essential. They are listed herewith—not, however, according to their importance:

1. *Cigar, Candy, Magazine and Newspaper Counters.*—These produce a revenue which is an important factor in the income of the buildings.

2. *Ballrooms.*—Used for all university, class, club and fraternity dances. The rental of these rooms should provide a moderate income.

3. *Cafeterias.*—Found in almost all student unions to be an excellent revenue agent.

4. *Private Dining Rooms.*—Moderately profitable and very essential; widely used by faculty and undergraduate groups on special occasions.

5. *Dining Rooms.*—Waiter or waitress service; usually provide only a small revenue.

6. *Billiard Rooms, Game Rooms, etc.*—Usually very profitable. While they require a great deal of attention and supervision, they are recreational features which are revenue-producers and in every instance popular.

7. *Barber Shops.*—The revenue produced from this service is usually a minor factor in the income of the unions.

8. *Guest Rooms.*—Depending on the facilities found in the college in which the student union is located, guest rooms can be very profitable. The student unions in cities where there are adequate hotels do not, as a rule, have guest-room facilities. In the smaller towns, however, they are extremely profitable when they are established as part of the service of the student union.

9. *Soda Fountains.*—Found in almost all student unions; usually connected for service purposes with the kitchen of the cafeteria, and in all instances profitable enterprises.

10. *Bookstores.*—Located in only a few of the student unions, but in those instances very profitable.

11. *Theaters.*—Five of the student unions have theaters. The revenue produced from the operation of these units is small.

12. *Bowling Alleys.*—Found in a number of the student unions, and in most instances profitable.

A list recently compiled by the Association of College Unions indicates that 37 activities are considered desirable for a complete student union. They are:

Alumni offices
Art rooms
Administrative offices (union)
Banquet rooms
Bowling alleys
Barber shop and beauty shop
Cafeteria
Committee and conference rooms
Cigar, candy and news counters
Cooperative student store
Dining room
Ballroom
Faculty rooms
Game rooms (cards, chess and checkers)
Hotel rooms
Information bureau
Library
Locker and check rooms
General lounge room
Men's and women's lounge
Magazine and newspaper rooms
Music room
Organization offices for activities
Pool and billiard room
Branch post office
Reading rooms
Reception room
Rest rooms
Radio broadcasting room
Soda fountain
Shoe-shining stand
Theater
Washroom
Smoking rooms
Writing room
Tailor shop
Swimming pool

Some unions have additional facilities, but here again must be repeated the statement made earlier, that local conditions, tradition and student requirements in any particular university govern the desirability of these additional services. A partial list would include: travel bureau, commuters' lunch room, ticket bureau, employment bureau, tutoring bureau, "Lost and Found" bureau and housing bureau.

The facilities around which the real work of the union centers are, quite appropriately, the non-revenue-producing units. It is these sections of the union that establish the social and cultural values for the university student.

Adequate equipment, tastefully designed and arranged, in a well-planned, well-designed and well-decorated room, enhances the comfort of the student during his leisure hours. Such lounging and reading rooms should be always available to the student. The only rooms which should be reserved for special groups should be the private dining rooms, special meeting rooms, the ballroom and other units that lend themselves to specific use by small social groups.

Pitfalls to Be Avoided in Planning

In a questionnaire submitted to the members of the Association of College Unions in 1932, the question was asked: "What mistakes have you found in your building that would be corrected if you were to rebuild?" The answers, naturally, were as diversified as might be expected of a group of buildings that are so varied in the facilities which they offer. Practically all the unions, however, complained of inadequate space. One institution reported: "It would be fair to say that a mistake was made in not making provisions for expansion in an economical and artistic way." Another stated: "We need a larger Student Union in every respect." One of the larger student unions, constructed only two years before the report was prepared, made this observation: "We have an insufficient number of rooms for group meetings and specialized functional use." Another complaint, which seems to be universal in the larger buildings, is of the failure to include elevators. Unions that have rooms on the third and fourth floors find that their use is limited because the students prefer not to book meetings in the rooms, owing to the difficulty of getting people to attend in an out-of-the-way section of the building. Elevators, had they been installed, would have obviated this complaint. Ventilation also was a factor which most directors reported had not been properly cared for. Check-room space and storage space are also an important need which has not been adequately met.

A digest of all these responses would indicate that even the most optimistic estimates as to the use of the building by the student body have been exceeded to such a degree that the major mistake to avoid is one of inadequacy of space for all purposes, and failure to provide for expansion on the unit basis. It is a fact that once the students become accustomed to the use of the building regularly, the facilities for recreation and social development prove so intriguing that the most enthusiastic estimates of student use are surpassed.

It is desirable, therefore, that opportunities for expansion be provided when plans are being prepared. Almost all the buildings recently constructed have been designed on the unit system.

The Social Program

The social program of the student union is less subject to standardization than the operation of the service departments. There is no typical union social program. A recent survey by the Association of College Unions disclosed that there are 123 types of recreational functions and social services, which involve some social planning by the union manager or the student board, as distinguished from simply providing lounging or dining rooms for students, or a meeting place for other campus organizations. Of the 123 types, not one is to be found in all student unions, and only a few are sponsored by the majority of them. Some of these few, on which there is at least a 50 per cent agreement, are: acquaintance parties for freshmen, regular dances, special celebration dances, billiard, chess, ping pong and bridge tournaments, and billiard exhibitions and instruction.

It is a significant fact that 67 per cent of the students who come to the union-planned programs, according to a count recently made by a member of the Association, come to social events—dances, ban-

quets, teas, smokers, etc. The remaining one-third of the students are attracted to the student union by a wide variety of activities—concerts, lectures, discussions, tournaments, etc.

Fees and Financing

In most instances a student fee is charged for the students' use of the union building. Usually this is collected by the treasurer's office and allocated for student union purposes. These fees, together with the income from the revenue-producing departments, are usually adequate properly to maintain and operate the building and its social and recreational program. There are several instances, however, where student unions are supported entirely by the profits from the revenue-producing departments and no student fee is levied.

Administration

The student union is generally headed by a paid director, appointed by the board of trustees or by a governing board of some sort which has supervision over the student union. In the larger unions the director's staff consists of two or three assistants. He is responsible directly to a board of governors. This board varies in size but includes members of the faculty, the alumni and the student body. The students, properly enough, usually have the largest number of members on the board. They take an active interest in the affairs of the student union, dividing their membership into a number of committees, each charged with the responsibility of some specific activity. The degree of efficiency varies, but it is fair to say that in most instances the students contribute a great deal to the welfare of their fellow-students by supervising activities for their benefit, and gain valuable experience in the management and direction of a large social unit.

In order that the managers and directors of student unions throughout the country might be better informed as to the methods employed in the operation of other student unions, the Association of College Unions was organized in 1916. It has at present a membership of 52. This group has organized statistics and information, photographs and plans so that they can be used as guides for institutions that are contemplating the construction of a student union or are interested in any way in the development of a student union program.

Part II—A Union for a Large University

By PORTER BUTTS

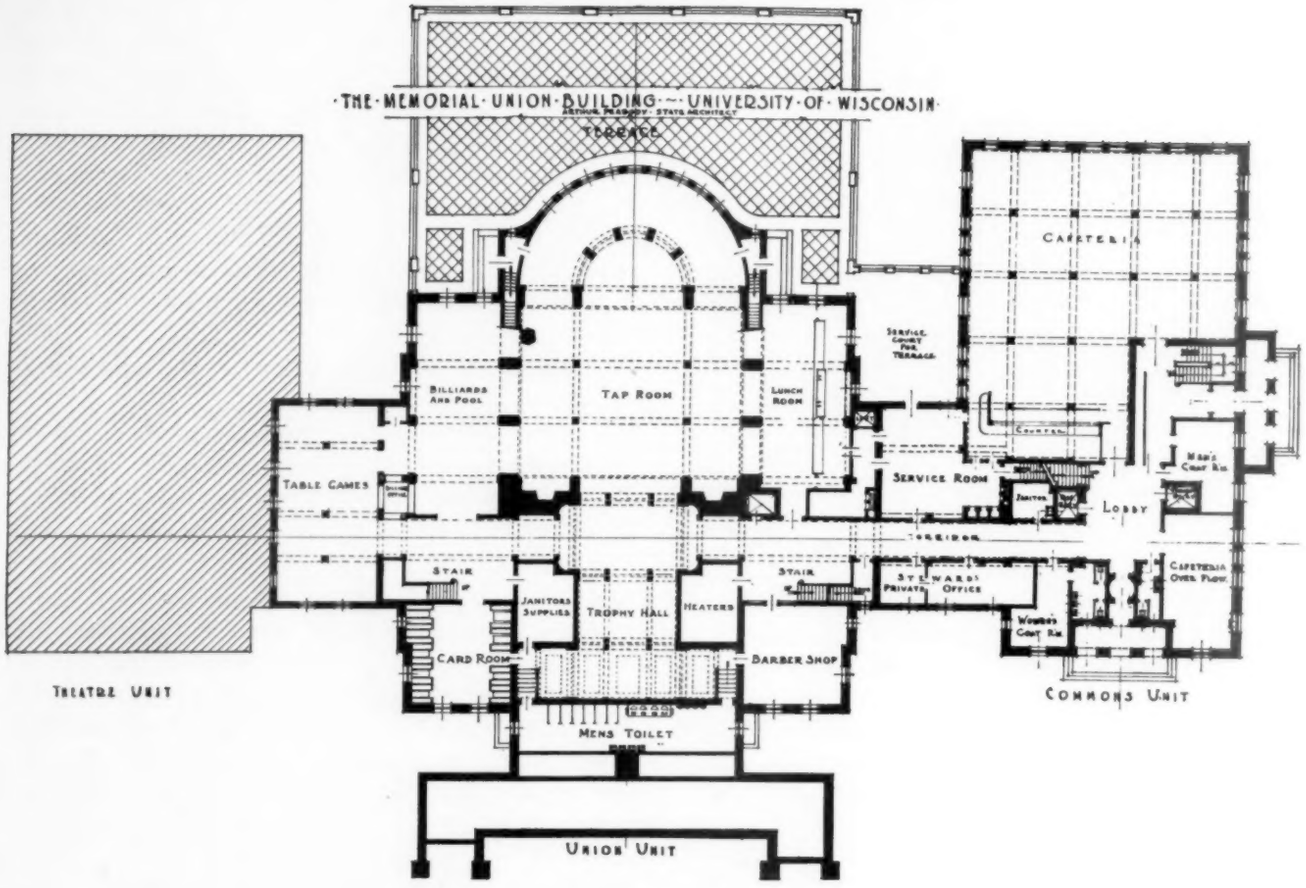
House Director, The Wisconsin Union, University of Wisconsin

IN DRAWING the plans for the Wisconsin Union, the basic problem was to organize under one roof facilities which would make possible a community life for 8,000 men and women students and 1,000 faculty members. Halls for the large group activities of the campus, and rooms for the day-to-day informal use of individuals, were indicated.

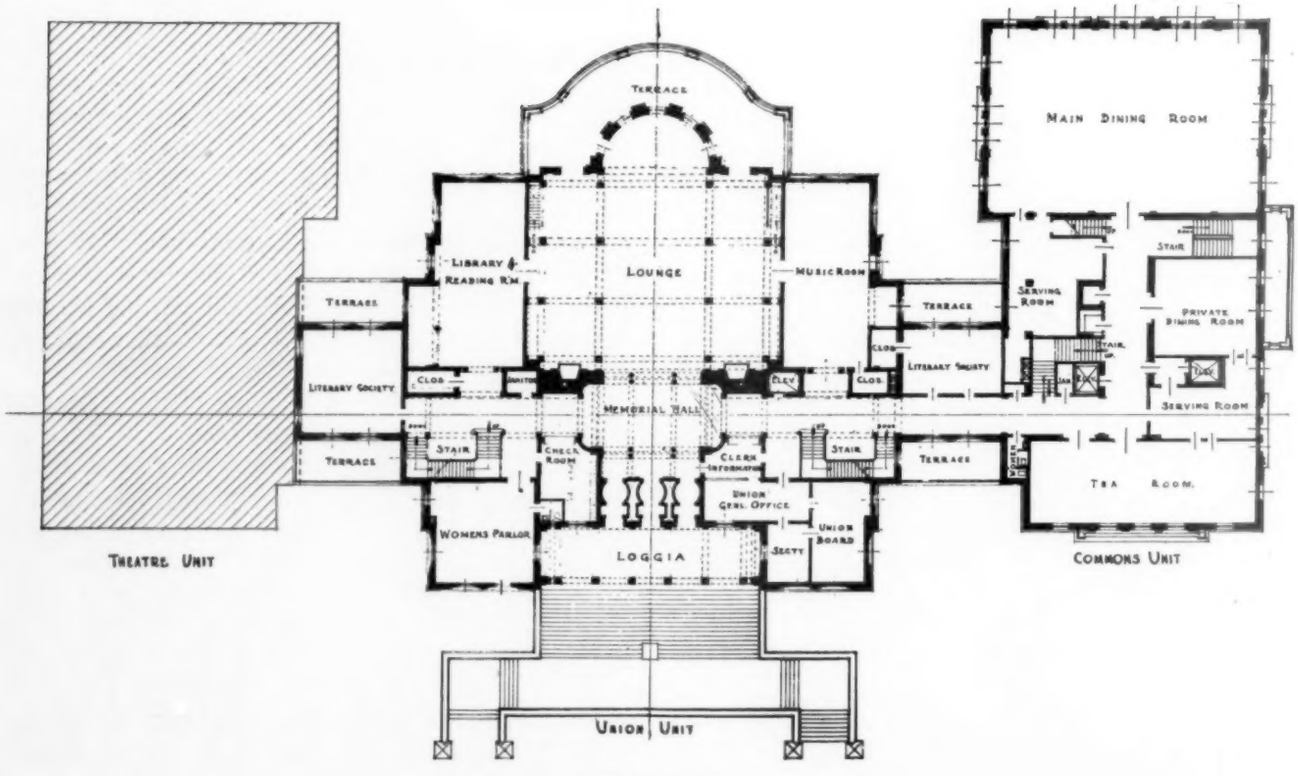
The dining table, universally the symbol and center of family social life, was seen as the natural and necessary daily gathering place where the influences of conversation and of group life might work out most effectively. And so the "commons" envisioned by Charles R. Van Hise, in 1904, then President of the University, was realized in four large dining rooms: Tripp Commons for large group dinners and special occasions; the Refectory, offering a cafeteria service to meet the contemporary need for serving at low cost large numbers of students not housed in dormitories or fraternities; the Rathskeller (or taproom), an informal retreat for men, with refreshment service; and the Georgian Grill (or tea room), a room of special distinction, giving table d'hôte service and adapted to family gatherings and the entertainment of guests. In addition, six private dining rooms were created to serve club, committee, and discussion meetings.

The dining facilities were concentrated in one wing of the building, together with a few guest rooms to accommodate returning alumni and visiting parents, supplying one large functional unit which would pay for itself.

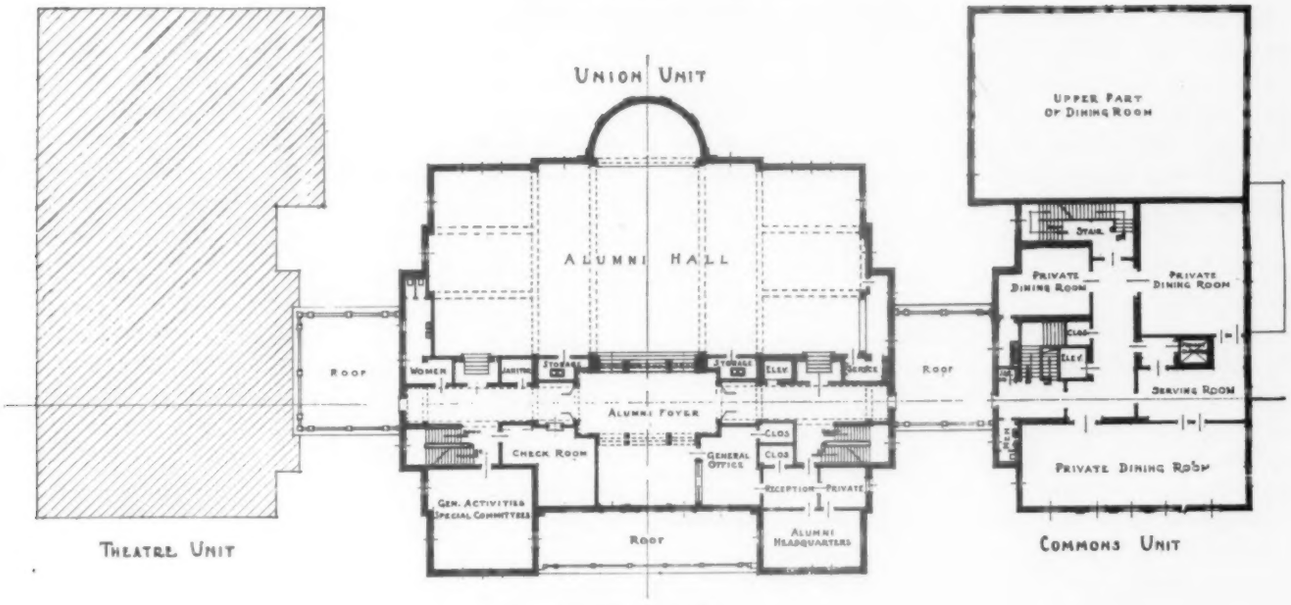
The living space of the building was so organized that men students might have reasonably private quarters for lounging, games, and discussion on one floor, women students the same privacy on another, and men and women joint social facilities on the floor between. This common ground, entered from the main memorial lobby of the house, was planned as the living room of the campus, supplying the elements of a congenial home life, which students cannot readily reconstruct on the campus for themselves: a place to meet with friends, newspapers from home, periodicals, radio, writing tables, afternoon tea, etc., in an informal atmosphere.



Ground floor plan



First floor plan



Second floor plan

Recognizing the value of well-used leisure as a cooperative factor with study in education, the University placed in immediate proximity to the informal living quarters of the house, where the stimulation to productive recreation would be felt daily, a small art gallery, a recreational reading room, a piano and a phonograph, and a library of symphonic recordings.

In other parts of the house these more definitely cultural opportunities were extended by a handicraft workshop and photographic dark-rooms. In addition, the ballroom and other social rooms of the house were so planned that they might be given over several times each week to large concerts, educational motion pictures, forums and lectures.

Third floor plan

Nothing was considered foreign to the building's purposes that ministered in any helpful way to the hours spent outside the classroom. Billiard and other game rooms were therefore included and game instruction provided; the work activities of student organizations were cared for in a floor devoted to student offices.

Unit Construction

The building was planned for unit construction, partly owing to the initial lack of funds, but altogether a fortuitous circumstance in the light of rapidly changing social habits and campus needs since construction first began in 1928. With the enlightening experience of operating the commons and the social unit for nine years to guide it, the University can now plan the next unit with assurance.

It seems clear that what is most needed are the community values supplied by an auditorium where large groups of students can feel the inspiration of common thought proceeding from a speaker, and share in common the recreation and the cultural development provided by student-created or professionally-presented drama, music, motion pictures, pageantry and dance. Plans are now being drawn, therefore, for an auditorium with full stage equipment, rehearsal rooms, scene-building workshops, and a small laboratory theater for experimental work.

The ultimate goal is to develop a community center with congenial accommodations for virtually every type of group activity, save athletic—that students may have the maximum opportunity for the profitable cultivation of leisure time and that the University may continue to be an authentic community of teachers and students.

Part III—A Small College Union

By CARL LAUTERBACH

Director (1930-36), Todd Union, College for Men, University of Rochester

TODD UNION (see page 483) was one of eleven buildings erected on a new campus beside the Genesee River during 1927-30 to make more adequate provision for the College for Men at the University of Rochester.

Requirements of the Union

There were a number of local factors to be considered in developing plans for Todd Union. The student body then numbered about 600, but in all probability would be increased to a total of 900 in a few years. There were about 225 resident students, all others being either citizens of the city of Rochester or commuters from surrounding towns. Fifty per cent of the students were fraternity men. At least seven fraternity houses were to be erected on the campus around a quadrangle facing the college Union. These houses would provide dormitory quarters, dining service, lounges, and other facilities. The provision for dining service in the Union building was to be based upon self-service breakfast and luncheon and table d'hôte dinner.

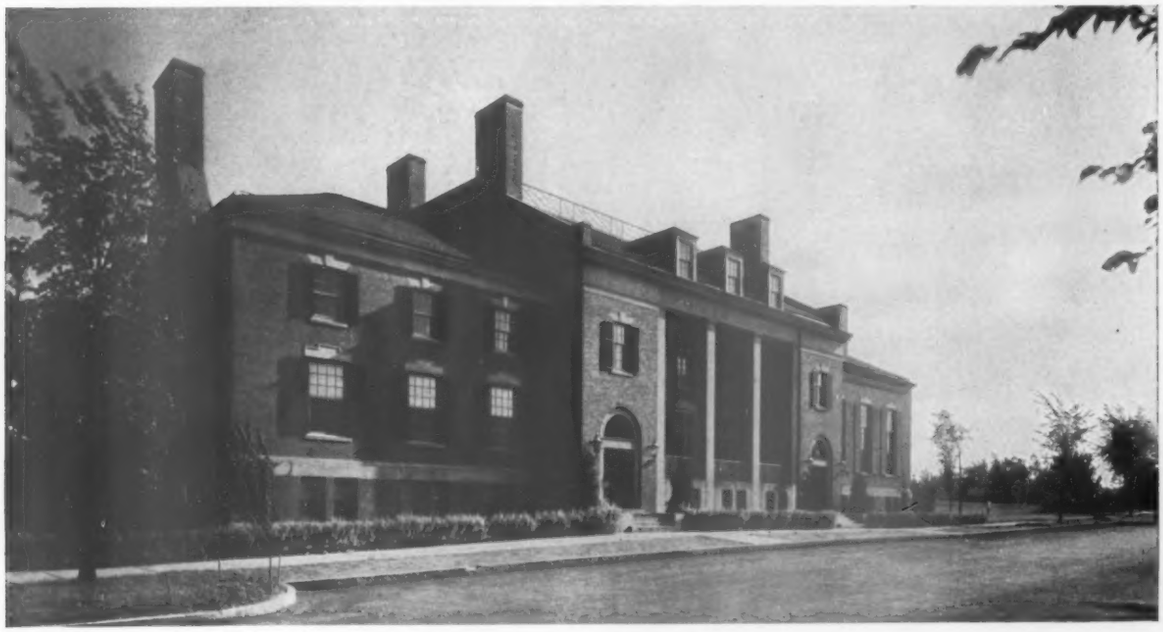
The floor layout was to be such that the large dining hall with the adjoining lounge would accommodate the college dances. The building was to be small at the outset, for the success of college unions in small colleges had not yet been fully demonstrated. For psychological reasons, it was hoped that the facilities might be heavily taxed from the outset. Though the building was to be small, provision for future extensions should be planned. Quarters for food preparation were to be adequate to handle the larger service of the near future. The architecture must harmonize with the colonial pattern of other buildings, and the interior decoration must be in keeping with the colonial motif and should incorporate some of the early traditions of the Genesee Valley.

Use of Facilities Suggests Improvements

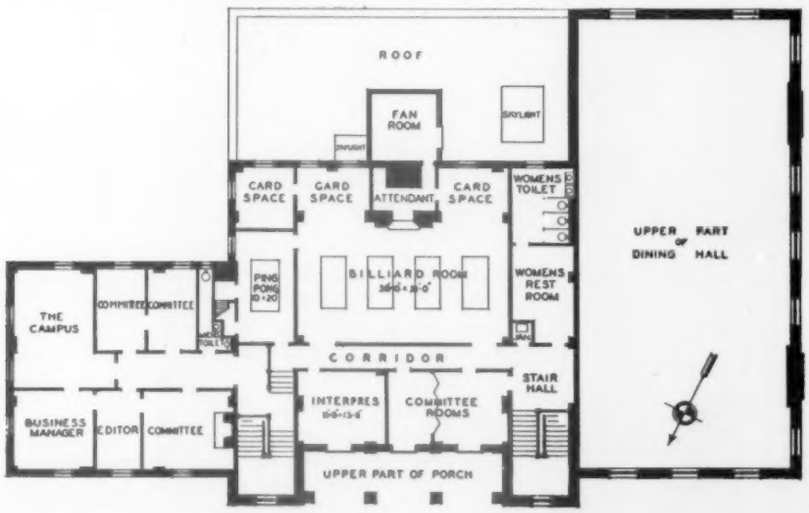
Todd Union opened its doors in 1930 and was heavily used from the first day. It has successfully provided the facilities (enumerated elsewhere in this issue) commonly found in small unions today, and through the program built up by the students around the facilities the Union makes "for the enrichment of our college life."

For the benefit of college administrators contemplating the erection of a small union building, it may be helpful to indicate changes that would be made as the result of experience could the building be rebuilt. They would include consolidation of the large dining halls and provision for two lounges instead of one; and, in addition to small committee rooms, there would be one large committee or club room, capable of comfortably accommodating thirty or forty students.

First floor plan



Todd Union, University of Rochester



Second floor plan

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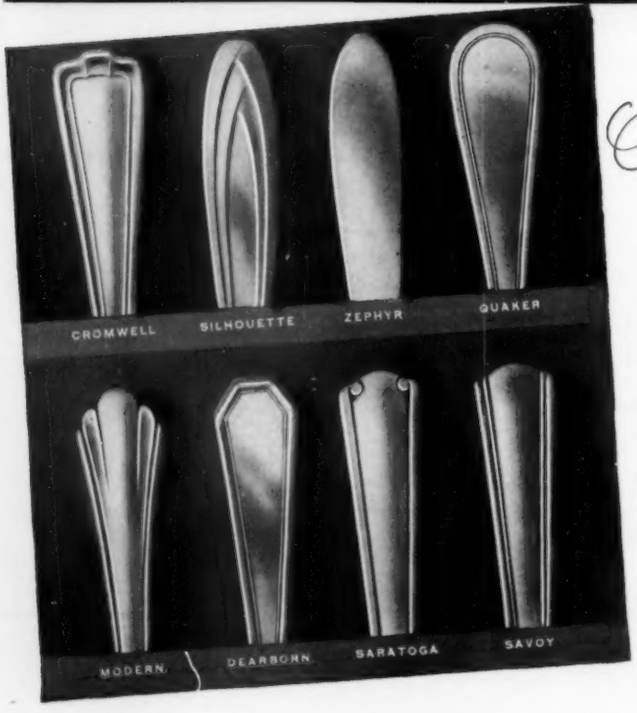

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A few unusual and distinctive flatware patterns are illustrated — designed especially for School and Fraternity dining room service.

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Style . . . with Stamina. Outstanding popularity and unique manufacturing processes . . . plus consequent volume production . . . account for the range of low prices of the seven flatware designs shown at the right. Each pattern is made from either a heavy or extra heavy "blank" of 18% nickel silver and plated with pure silver according to recognized schedules. All seven are worthy representatives of the reliable workmanship and quality so characteristic of the products of this 103-year-old firm of silversmiths.

Another important factor has not been overlooked—simplicity in design, insuring easy and complete cleansing.

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ROXBURY	SAXON	KENT	WINDSOR	EXETER	CHOATE	ANDOVER	Quality
							Note—In the descriptions below references are made to "9-lb. blanks" and other weights. This means that a gross of Tea Spoons weighs 9 lbs. . . . etc.
			$.80 per doz.				The most for the least money. Half Plate . . . Plus. Heavy 9-lb. "blanks."
	$.85 per doz.	$.85 per doz.	$.85 per doz.				Longer wear at slight additional cost. Half Standard Plate—Sectional . . . extra plating at points most exposed to wear, on staple pieces. Heavy 9-lb. "blanks."
			$1.00 per doz.				Less cost over long period of use. 5 oz. Plate (tablespoons) sectional . . . heavier than standard plating; more silver at "wear points" of staple pieces. Heavy 9-lb. "blanks."
			$1.35 per doz.				Same as next above . . . except that "blanks" are 11-lb. extra heavy.
				$1.40 per doz.	$1.40 per doz.		Also same as above as to plating schedule . . . but based on "fancy" patterns (Exeter and Choate) and extra heavy 10½-lb. "blanks."
	All prices quoted are for Tea Spoons only					$2.50 per doz.	Greater economy in the long run. AA Sectional: 6 oz. plate (tablespoons), much heavier than standard, with extra plating at "wear points" of staple pieces. Extra heavy 11½-lb. "blanks."
$2.50 per doz.							Same as next above . . . except that "blanks" are 10½-lb.

All prices subject to change without notice.

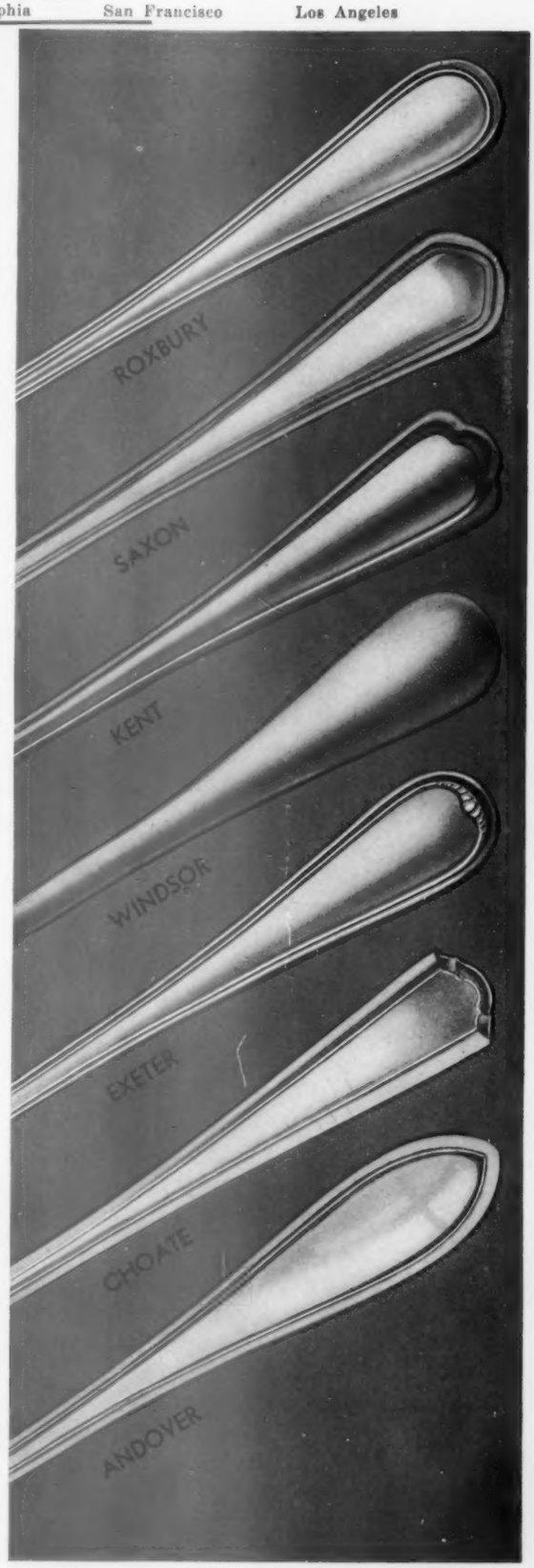
28R—Covered Sugar, 4 oz., Each $3.75 net

28R—Coffee with Bakelite handle, 8 oz., each $7.80 net

28R—Cream, 2 oz., each $1.95 net

28R HOLLOW WARE SERVICE—Strong and durable nickel silver base metal, silver soldered throughout, with extra heavy hotel plating, standard for the highest grade of institutional silverware. Double thick metal reinforces points of greatest wear . . . seamless bodies, spouts, etc., cannot crack . . . no inside corners or angles to collect dirt. Low priced, practical and scientifically designed—meeting all requirements of heavy service. Only three items of complete service are shown above.

A copy of our complete catalog, featuring both flatware and hollow ware, will be sent on request.



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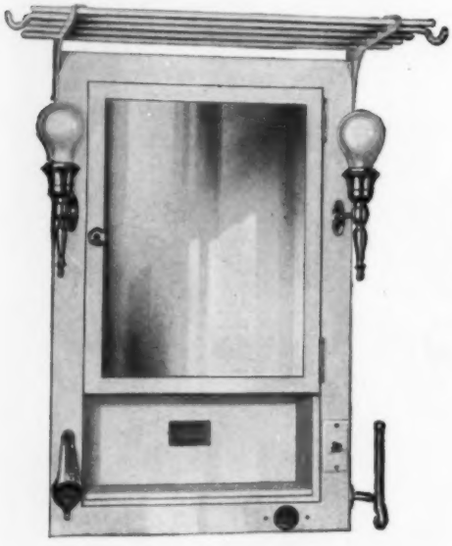
MIAMI Bathroom CABINETS Mirrors and Accessories

Warehouse stocks are carried in New York City, Philadelphia, Pittsburgh, Baltimore, Washington, D. C., Birmingham, St. Louis, Milwaukee, Boston, Miami, Cleveland, Columbus, Cincinnati. Representatives in many other strategic points.

Included in the list of prominent schools, colleges and universities where MIAMI Cabinets are installed are: Notre Dame, Columbia, Yale, Texas, Duke, John Carroll and many others throughout the country.

For seventeen years MIAMI Cabinets have been recognized as the finest examples of bathroom cabinet construction. They are distinctive in design, beautiful in appearance, strongly built of highest quality materials and finished to give lifetime service under hard usage.

The MIAMI Line includes models to meet every requirement. A few cabinets especially adapted for schools and other public and private institutions are illustrated and described on these pages. Complete catalog and details will be mailed upon request.



Dormitory Special

DORMITORY SPECIAL CABINET

Regular equipment for the Dormitory Special consists of straight overhead towel tray with douche bag hooks, two bronze, **chromium-plated** light brackets, light switch, combination face towel and razor strop hook, convenience plug for electrical accessories, razor blade drop, three adjustable glass shelves and one white Vitrolite shelf.

Cabinets are completely wired at factory.

SPECIFICATIONS

Overall	16¾″ x 26¾″
Mirror	12 ″ x 16 ″
Wall Opening	13½″ x 24½″

SQUARE TOP MODEL

This square top model, with mirror set in stainless steel frame, is recommended for the bathroom where the design is straight lined rather than arched or curved.

Fitted with **selected** No. 1 plate glass mirror, **copper backed,** guaranteed for five years against silver spoilage. Cabinet doors are the heavy air-cushion type hung on heavy piano hinges. The cabinet bodies and door backs are finished in three coats of first-quality **baked enamel** applied over rust-resisting under-coat. Cabinet is fitted with three glass shelves and tooth brush racks.

SPECIFICATIONS

	Overall	Mirror	Wall Opening
2030-P	16¼″ x 22¼″	16″ x 22″	13¾″ x 19¾″
2040-P	18¼″ x 24¼″	18″ x 24″	15¾″ x 21¾″
2050-P	20¼″ x 28¼″	20″ x 28″	17¾″ x 25¾″

Nos. 2030-P, 2040-P, 2050-P

Nos. 1100, 1150, 1175

MASTER MODEL WITH TUBULAR LIGHTS

Chrome framed; no knob, hardware or portion of the body is visible. Frames are one-piece solid brass, chrome applied over nickel. Cabinet body and door back finish is Miami Crystal Snow. Heavy chromium-plated, piano-type hinges, copper-backed mirror, three plate glass shelves, drop for used razor blades, tooth brush racks.

Metal parts of light brackets are brass, finished in deep, lustrous chromium. Glass shade is opal, designed to take T-8 bulb, either 40 or 60 watt. Bulb is available at all stores that sell light bulbs. Cabinet is complete with light switch and convenience plug.

SPECIFICATIONS

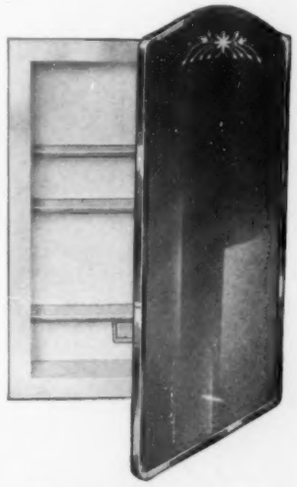
	Overall	Mirror	Wall Opening	Return Flange
No. 1100	16¼″ x 22¼″	16″ x 22″	13¾″ x 19¾″	¼″
No. 1150	18¼″ x 24¼″	18″ x 24″	15¾″ x 21¾″	¼″
No. 1175	20¼″ x 28¼″	20″ x 28″	17¾″ x 25¾″	¼″

FRAMED VENETIAN MODELS

Mirror on Model 1622-BF is set in rich black enamel frame. Mirror on Model 1622-CF is set in a brass, chromium-plated frame. Mirror frames are of one-piece construction, no open joints at corners. Mirrors are selected No. 1 plate glass, copper backed. Three adjustable, bulb-edge glass shelves, chromium-plated razor blade drop, two tooth brush holders, four cadmium-plated installing screws; cabinets finished in three coats of first-quality baked enamel applied over rust-resisting under-coat.

SPECIFICATIONS

	Mirror Size	Wall Opening
1622-BF Black Frame	16¼″ x 24¼″	13¾″ x 19¾″
1622-CF Chrome Frame	16¼″ x 24¼″	13¾″ x 19¾″

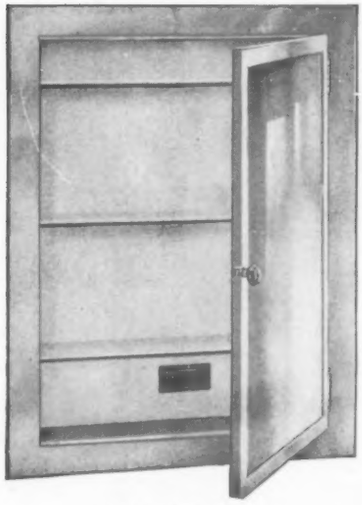


Nos. 1622-BF, 1622-CF

FLUSH DOOR RECESSED MODEL CABINETS

These models are especially recommended for the modest bathroom where price is to be considered. They are practical in design, rugged in construction, and of a uniformly high quality.

Made from heavy gauge ARMCO autobody steel. Adjustable glass shelves, copper-backed mirrors, nickel-plated hinges, razor blade drop, tooth brush racks. Finished in high-grade baked enamel. Bevel or plain mirrors may be had in any of these cabinets. Specify type of mirror when ordering.



Nos. 200, 220

SPECIFICATIONS

Model	Mirror	Inside	Overall	Wall Opening
200	12″x16″	13″x17″	16¾″x20¾″	13½″x17½″
220	14″x18″	15″x19″	18¾″x22¾″	15½″x19½″
210	12″x16″	13″x23″	16¾″x26¾″	13½″x23½″
230	14″x18″	15″x25″	18¾″x28¾″	15½″x25½″

Nos. 210, 230

UNIVERSAL EQUIPMENT COMPANY

Batesville, Indiana

U-3A Dresser Base
U-3¼ Mirror

Years of experience in designing, producing, and installing institutional furniture enables us to offer among many other groupings these Early American pieces recently supplied for one of the more prominent girls' dormitories. Aside from its pleasing and HOMELIKE APPEARANCE, this furniture must also be considered not for one but all the following details:

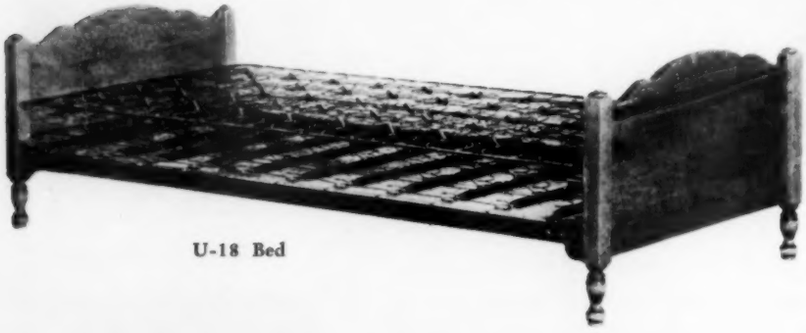
DURABILITY—This is probably the most important feature of Universal Equipment Company's institutional furniture. Our many years of experience has taught us what to expect, and to incorporate extra strength in every possible way practical in its manufacture.

PRACTICABILITY—The average dormitory room is limited in space. Therefore, furniture must be designed accordingly. Our varying styles and sizes will permit your installation to be most efficient and yet retain the cozy and liveable appearance so much desired.

FINISH—Universal Equipment Company's furniture is available in a choice of woods—Oak, Maple, Mahogany, and Walnut; and is finished in an attractive color tone, with special permanent institutional top coats that provide beauty and permanence.

SPECIAL DESIGNS—We are prepared to submit layouts, to design and build furniture to individual liking, or to harmonize with the architecture of your building. We earnestly solicit your inquiries.

CONTRACT BIDDING—The numbers illustrated here are merely suggestions. Please submit your specifications. Our prices will be computed and submitted to you promptly.



U-18 Bed

U-9 Chair

U-22 Lounging Chair

U-27 Desk Top

For Your
CAFETERIA
LIBRARY
RECEPTION ROOM
and
DORMITORY

U-2 Desk

DOEHLER METAL FURNITURE CO., INC.

For Dormitory—Cafeteria—Reception Room—Infirmary

DORMITORY CAFETERIA RECEPTION ROOM
INFIRMARY CHROMIUM BEDDING

Executive Offices: 192 Lexington Avenue, New York

BRANCH OFFICES

Boston
99 Portland Street

Cleveland
2184 East 9th Street

Washington
209 Mills Building

DOEHLER CHROMIUM FURNITURE FOR CAFETERIAS AND RESTAURANTS

Doehler modern chromium furniture has definitely proven its value for cafeterias in educational institutions. It is distinctive and rich in appearance yet remarkably modest in cost. The tables and chairs are sturdy and durable in construction—built to withstand the hardest usage. The smart modern styling is also very economical in floor space—you will secure maximum seating capacity without crowded appearance. The colorful, cheerful upholstery coverings are especially intended for long wear and easy cleaning. Table tops will resist cafeteria use and abuse—all standard top materials are available. Doehler modern chromium furniture is being used extensively in refurnishing old cafeterias as well as in equipping new buildings.

WRITE FOR ILLUSTRATED CATALOGS AND COMPLETE DETAILS

DOEHLER CHROMIUM FURNITURE FOR LOUNGES, RECEPTION ROOMS, LOBBIES

Doehler modern chromium furniture offers many outstanding advantages for use in college reception rooms, lounges, lobbies and other public rooms. It is smartly styled in excellent taste and will harmonize with practically any decorative scheme. Prices are surprisingly moderate—considerably lower than other lobby furniture of equal quality and construction. You will get many years of service from this Doehler chromium furniture, because it resists all kinds of use and abuse. Send us your floor plans and we will supply suggestions and layouts—no obligation.

WRITE FOR ILLUSTRATED CATALOGS AND COMPLETE DETAILS

THE AMERICAN SCHOOL AND UNIVERSITY

DOEHLER METAL FURNITURE FOR DORMITORIES AND BEDROOMS

Doehler metal bedroom furniture is widely used in schools and colleges throughout the country. It has achieved an enviable reputation for quality and reliability. Our years of experience in equipping dormitories has enabled us to create and manufacture outstanding metal furniture particularly fitted to educational needs and budgets.

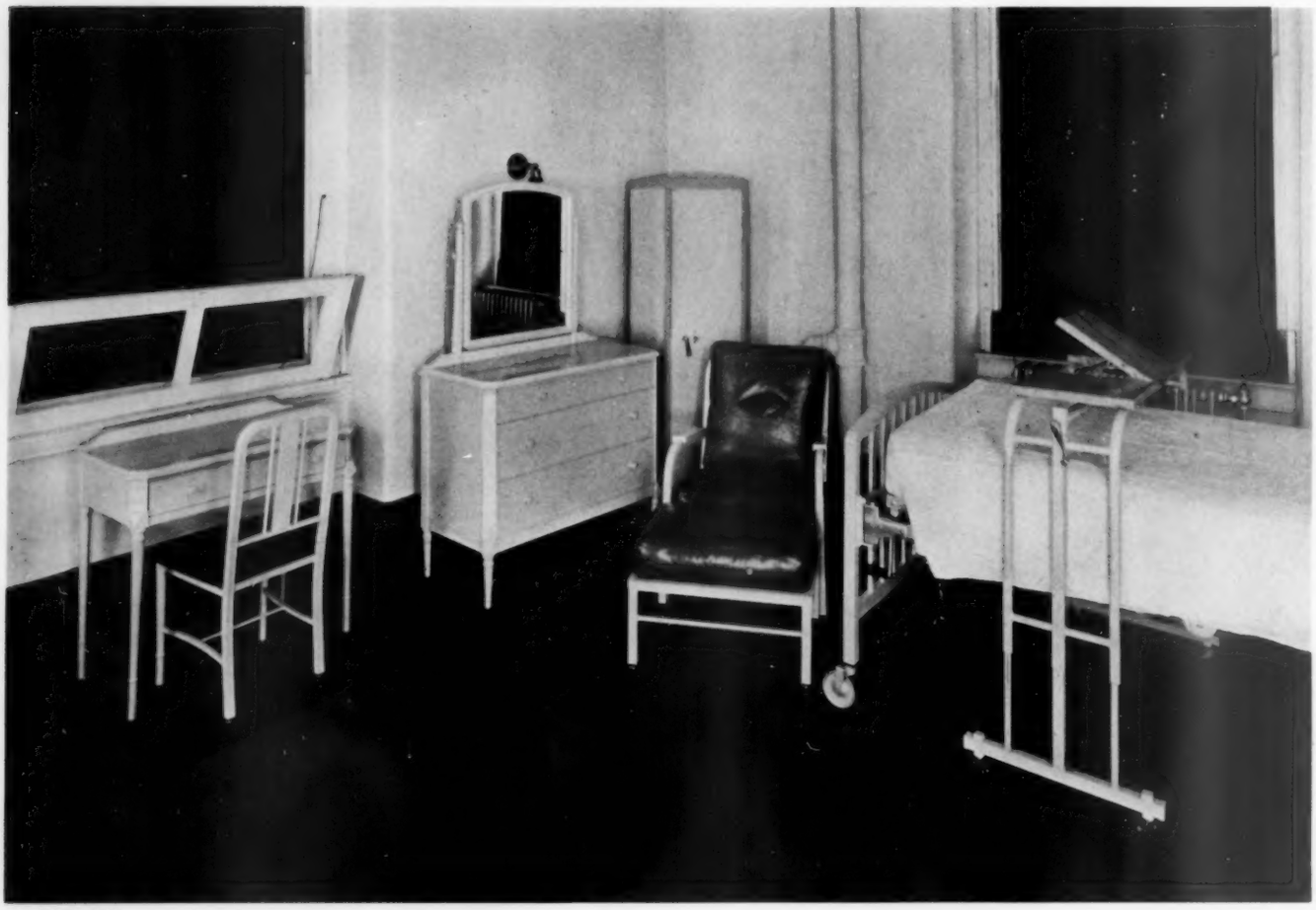
Our stock line includes an extensive range of designs in suites and separate pieces. It comprises both the traditional period design and the currently popular contemporary styles. All Doehler metal furniture is produced in both natural wood grain reproductions and in pleasing, cheerful colors.

Doehler metal furniture is really comfortable. All metallic sounds are eliminated; drawers always slide easily; it never loosens, cracks or splinters. The "Dohlite" finish always looks fresh and clean. It is resistant to cigarettes, hard knocks, steam heat and harsh climates.

WRITE FOR ILLUSTRATED CATALOGS AND COMPLETE DETAILS

THE AMERICAN SCHOOL AND UNIVERSITY

DOEHLER METAL FURNITURE FOR COLLEGE INFIRMARY USE



Doehler metal furniture has won the approval of the most exacting hospital executives. Thousands of hospitals throughout the United States are equipped with Doehler Metal Furniture. We can furnish every section of your infirmary—single rooms, wards, treatment rooms, etc. You will find our products attractive in appearance, practical in design and up to the minute in construction. Our experts are at your service to assist you in making up your equipment schedule.

DOEHLER SANITIZED MATTRESSES

Here's the answer to the most perplexing dormitory problem—"maintaining bedding in sanitary condition." We can now offer you mattresses so treated that they are self-sterilizing—practically germ proof. Doehler Sanitized mattresses will not convey infections since the covering is permanently sterile. It is no longer necessary to subject your costly mattresses to the deteriorating effects of steam or gas sterilization.

Doehler Sanitized mattresses are treated by a new revolutionary process which has successfully passed an exhaustive series of stringent tests recommended by the U. S. Government. These tests were conducted by reputable laboratories and their reports are available.

Doehler Sanitized mattresses are vermin repellent and odorless. It is important to note that this treatment is harmless to the tenderest skin, being non-toxic and non-irritating. Doehler Sanitized mattresses are available in all standard types—innerspring, cotton felt, curled hair, two-section felt and spring, etc. All mattresses are constructed with the highest quality of materials and embody scrupulously careful workmanship in up-to-the-minute designs.

This Sanitized feature is exclusive with Doehler but you will find our mattresses no higher in price despite this outstanding advantage. Let us quote on your requirements.

INQUIRE ABOUT OUR COMPLETE LINE OF SPRINGS, STUDIO COUCHES, DIVANS, COTS, ETC.

THE AMERICAN SCHOOL AND UNIVERSITY

EXCEL METAL CABINET CO., INC.

101 Park Avenue, New York

EXCEL METALCRAFT

Steel Kitchen Furniture for the School Homemaking Department

IN DESIGNING the equipment for school homemaking and foods laboratories presented in this folder, the aim has been to provide the highest standard of quality and the maximum adaptability to advanced educational practice. It is believed that through standardization of unit sizes and design the cost can be kept within the budget limitations of the average school. Experience has fully borne out this belief as increasing numbers of schools in all sections of the country are installing METALCRAFT Steel Kitchen Furniture.

The units described on the following pages will be found serviceable for a large range of requirements whether in the one-teacher department of the small school, the homemaking cottage or the foods laboratories of the great metropolitan high school. Where special equipment is needed we are prepared to supply it, although the cost will necessarily be increased.

The services of our staff are available to architects and school officials for assistance in the planning and equipping of homemaking departments.

Installation of home-making equipment in Lawrence High School, Lawrence, Long Island, N. Y. Lawrence J. Lincoln, Architect

EXCEL METAL UNITS

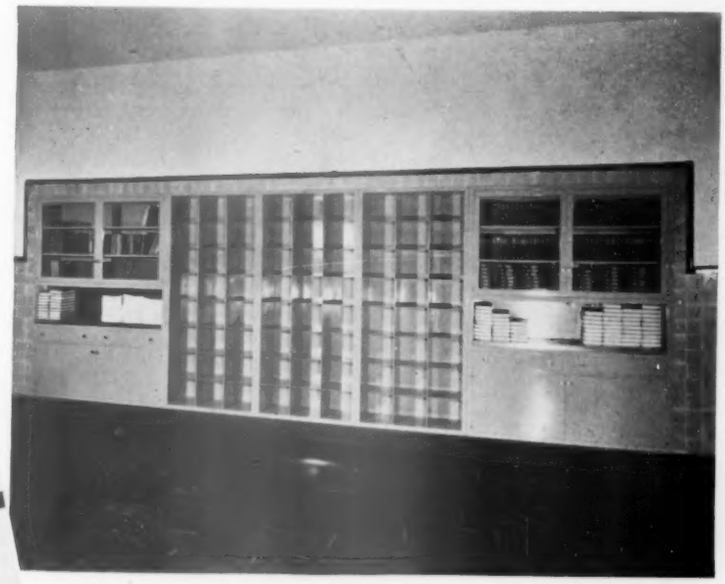
Students' Unit — Stainless steel work top; cabinets under, with built-in Range

Students' Units—Back to back

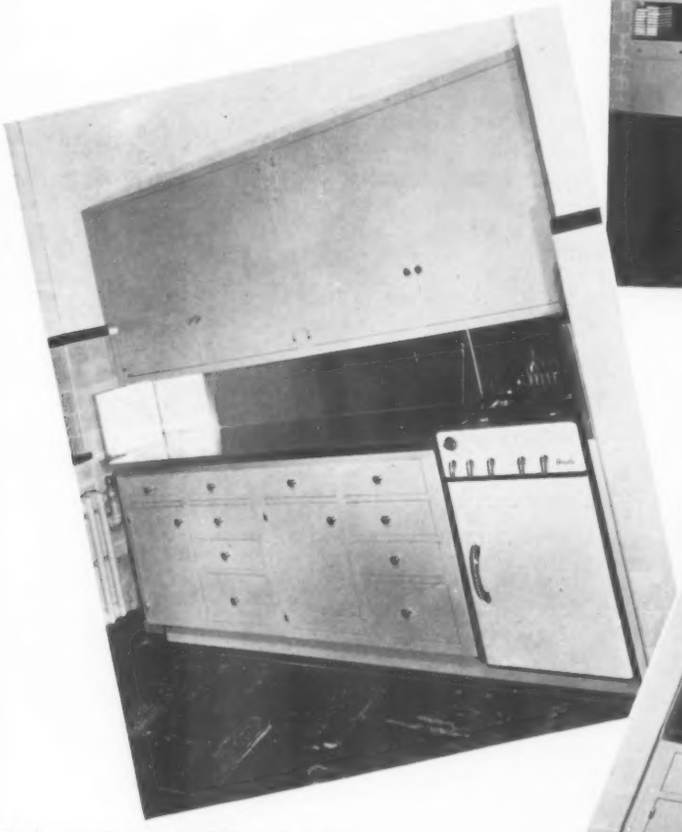
Sink Unit— Stainless steel sink and drainboard; cabinets under

Instructor's Unit—Stainless steel sink and drainboard; cabinets under

FOR SCHOOL AND COLLEGE CLASSROOMS



Storage cabinets and student pigeon-hole compartment for aprons, etc.

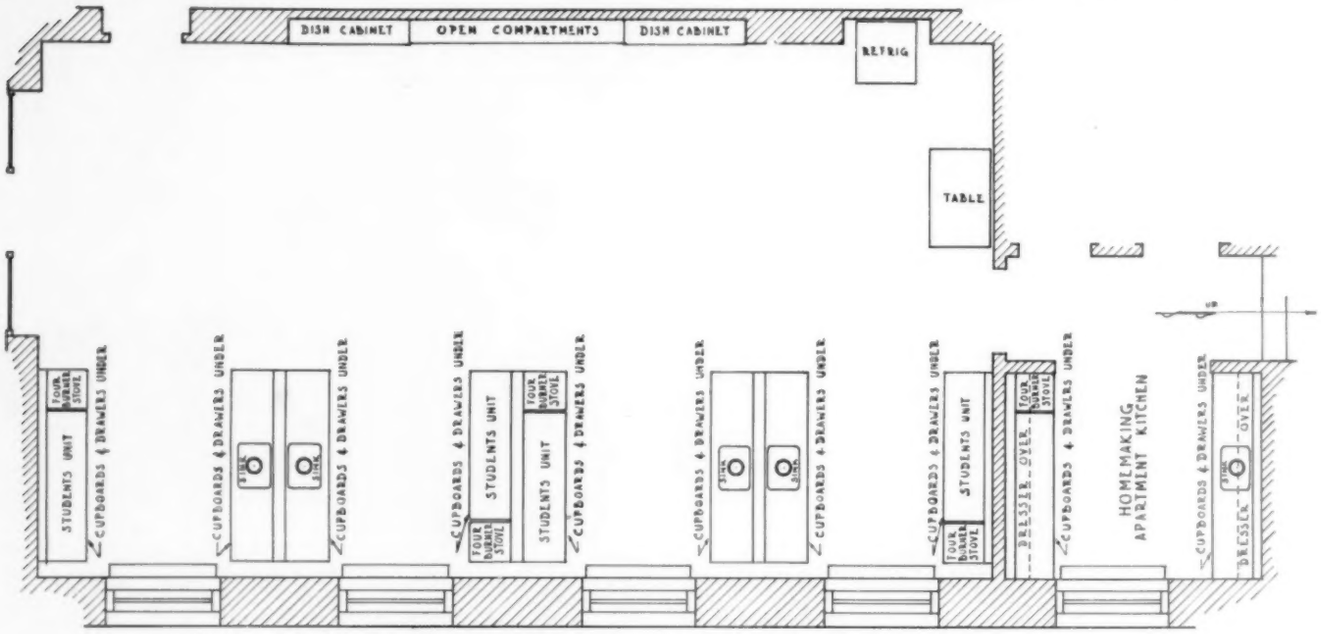


Students' Unit with dish and storage cabinets over, in homemaking apartment kitchen

Sink Unit with dish and storage cabinets over, in homemaking apartment kitchen

Table with stainless steel top and shelf; equipped with casters (Also furnished without casters)

FLOOR PLANS OF TWO HOMEMAKING LABORATORIES



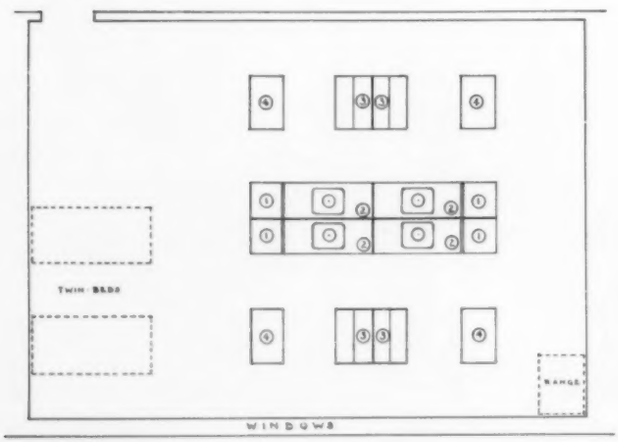
Lawrence High School, Long Island. Accommodating 20 Students

This floor plan shows the arrangement of Homemaking Laboratory in the Lawrence High School, Long Island. All the pieces of equipment shown are made up of combinations of standard Metalcraft Units.

The homemaking room is a well-planned, modern, scientifically furnished room consisting of four unit kitchens equipped with the essentials for work in family groups, four or five students working in each group. Each unit contains 1 sink of stainless steel with cabinet below, 1 work top of stainless steel with cabinet below, and built-in automatic four-burner gas range.

The apartment kitchen shown at right is equipped the same as the four units in the homemaking room.

To the left, directly off the homemaking room, there is a demonstration room used for lectures and discussion. This room contains an instructor's unit, illustrated on page 494.



Key to plan:

1—Four Burner Gas Range
2—Sink and Cabinet Assembly
3—Student Unit and Dish Cabinet
4—Work Table

This floor plan and cut below illustrate arrangement of a smaller and more economical installation in the Belmont High School, yet modern and efficient.

Belmont Bvld. School, Long Island
W. H. Spaulding, Architect

TYPICAL ASSEMBLIES OF EXCEL METALCRAFT STANDARD CABINET UNITS

Left

Sink Assembly

The sink assembly shown is 8′ 0″ long and consists of a stainless steel sink top with 8″ high back, two 36″ DC Base Units and one 24″ SE Sink Cabinet Unit

Right

Work Center or Dresser

These assemblies are made in 36″ and 48″ widths and are used as a combined Student Unit and dish closet. The counter top can be stainless steel or linoleum covered. The assembly consists of DC base cabinet with counter and DC upper section

Homemaking Apartment Unit

Consists of sink unit with two 30″ Type C and one 36″ Type B wall cabinet

Student Unit

This Assembly consists of a counter top of stainless steel with 48″ DC base cabinet. This Unit can be furnished in all sizes of our standard base units or multiples of these units. Linoleum counter tops can be supplied

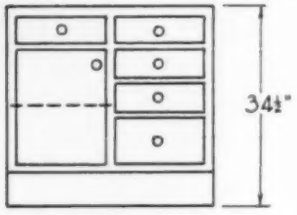
Storage Cabinet Assembly

This assembly of standard units provides adequate storage space for supplies, china, utensils, etc. By combining various sizes and types of units any desired arrangement and storage capacity may be obtained. The above assembly consists of a Type BC or SC closet on the left, a type A over the refrigerator, two DC, one DC and one CD on each side of the refrigerator. The two counter tops can be either linoleum or stainless steel

STANDARD TYPES AND SIZES

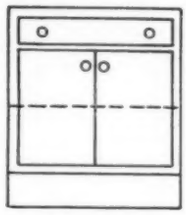
Metalcraft Homemaking Units

BASE CABINETS — 22″ DEEP

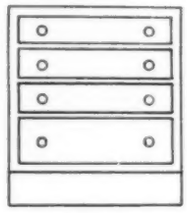


TYPE DC
36″ wide
42″ wide
48″ wide

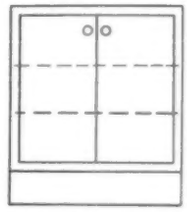
TYPE SE
24″ wide
30″ wide
36″ wide



TYPE CD
24″ wide
30″ wide
36″ wide
42″ wide

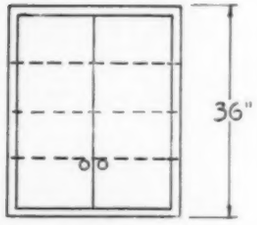


TYPE AD
24″ wide
30″ wide
36″ wide
42″ wide

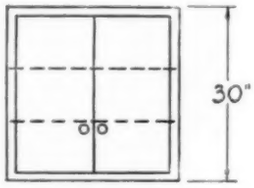


TYPE AC
24″ wide
30″ wide
36″ wide
42″ wide

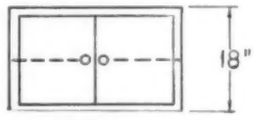
WALL CABINETS — 12″ DEEP



TYPE C
24″ wide
30″ wide
36″ wide
42″ wide

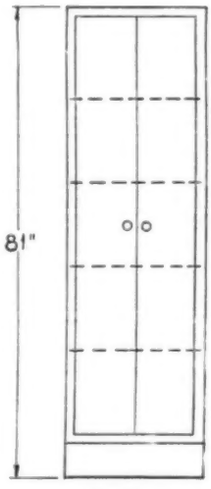


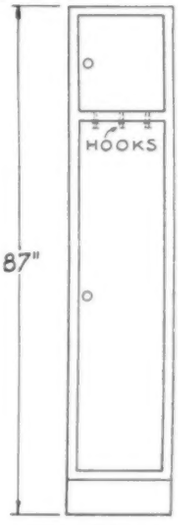
TYPE B
24″ wide
30″ wide
36″ wide
42″ wide



TYPE A
24″ wide
30″ wide
36″ wide
42″ wide

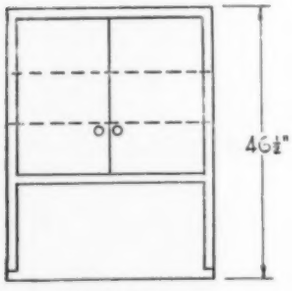
STORAGE AND BROOM CABINETS
22″ deep





TYPE SC
24″ wide
30″ wide
36″ wide

TYPE BC
18″ wide
24″ wide



TYPE UC
36″ wide
48″ wide
Upper section used with Type DC for free standing dresser

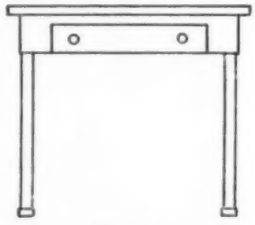
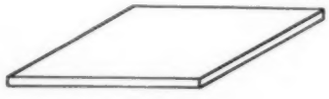
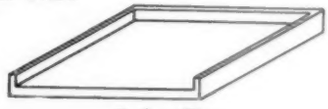


TABLE
42″ long, 24″ wide
48″ long, 24″ wide
Also furnished with casters and shelf

COUNTER TOPS



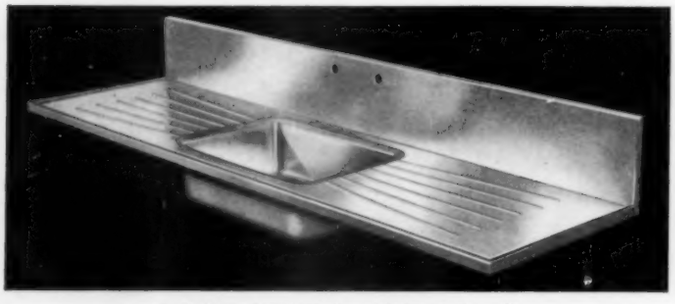
Flat Type



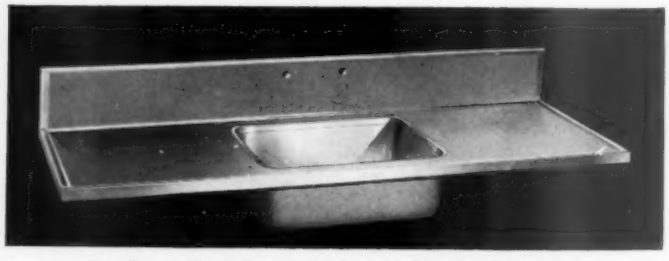
Ledge Type

Furnished for any size base cabinet shown or combination of sizes

SINK TOPS



Stainless Steel Sink and Drainboard



Linoleum Drainboard with Stainless Steel Sink

Sink Tops are made in any length required and constructed to meet conditions of any installation

ADAPTABLE TO ALL REQUIREMENTS

METALCRAFT Homemaking Units have been so designed that by combining the various types and sizes almost any desired arrangement may be economically obtained.

As will be noted on page 497 the recommended typical assemblies shown will answer almost every need in the modern homemaking department. The various units used to make up these assemblies are described, and on page 498 the individual unit types and sizes are illustrated.

Since there is a difference of opinion among architects and school officials as to what units comprise the most desirable assemblies, which is often influenced by the size of the budget, there are some who desire to work out their own ideas. This is made possible by the use of METALCRAFT standard individual units.

Attention is called to the fact that sink tops and counter tops are made to order and are furnished continuous in one piece in sizes to fit all units or any combination of units. A rough sketch showing desired arrangements of units in assemblies should accompany request for prices.

We shall be glad to submit suggested layout from floor plan, specification and quotation upon request.

SPECIFICATION OF CONSTRUCTION EXCEL METALCRAFT UNITS

Cabinets: Are constructed of 20 gauge furniture steel.

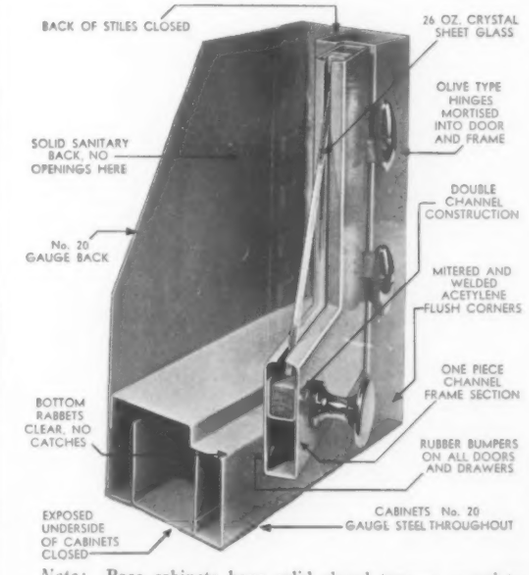
All corners of cases are mitered and acetylene welded without seams or joints forming a rigid front frame with continuous sides, bottom and back formed from one sheet of metal.

All doors and drawer openings have full continuous rabbets around all sides, connected at corners by welding, into which doors and drawer heads are recessed making a flush front construction.

Door and drawer heads are $\frac{5}{8}$" thick hollow metal construction filled with sound deadening.

All drawers are equipped with ball bearing rollers.

All shelves are adjustable and removable.


BACK OF STILES CLOSED
26 OZ. CRYSTAL SHEET GLASS
OLIVE TYPE HINGES MORTISED INTO DOOR AND FRAME
SOLID SANITARY BACK, NO OPENINGS HERE
DOUBLE CHANNEL CONSTRUCTION
No. 20 GAUGE BACK
MITERED AND WELDED ACETYLENE FLUSH CORNERS
ONE PIECE CHANNEL FRAME SECTION
BOTTOM RABBETS CLEAR, NO CATCHES
RUBBER BUMPERS ON ALL DOORS AND DRAWERS
EXPOSED UNDERSIDE OF CABINETS CLOSED
CABINETS No. 20 GAUGE STEEL THROUGHOUT

Note: Base cabinets have solid closed tops—a complete closed case. Base cabinets have top, bottom and side stiles forming complete rigid front frame. All hardware solid bronze—chromium plated.

All drawers equipped with ball bearing rollers

Soft white Para rubber bumpers are provided behind all doors and drawer heads.

Hinges are olive type solid cast bronze chromium plated, carefully mortised into doors and frames.

Pulls and knobs solid cast bronze chromium plated.

Finish: All cabinets have a filler and priming coat baked on and are then finished with the best quality synthetic enamel baked on in accordance with manufacturers' standards.

Colors of enamel: White, Ivory, Gray or Green. Special colors can be matched.

Counter Tops: Stainless steel tops are constructed of .031-22 gauge metal stretched over 16 gauge steel body heavily reinforced with channel stiffeners.

Linoleum tops are constructed of a 16 gauge body, reinforced with heavy channel stiffeners, upon which is securely cemented Armstrong's $\frac{3}{16}$" battleship linoleum. Edges of counters are bound with 18 gauge stainless steel which is rabbetted into linoleum making a smooth and flush surface. No screw heads appear on front of binding.

Sink Tops: A selection of sink tops is available and the type used usually is determined by the budget. All stainless steel tops make the best installation. Linoleum tops with stainless steel bowls and linoleum tops with porcelain bowls are available. Where the budget is extremely limited, cast iron enameled sinks can be used with or without cabinets under.

Ranges: When desired we can furnish ranges. Only fully insulated and fully enameled ranges with oven heat regulator are recommended.

THE BASSICK COMPANY

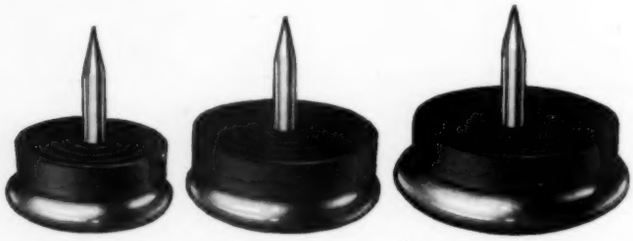
Bridgeport, Conn.

Bassick

CASTERS
Chair and Furniture Slides

RUBBER CUSHION CHAIR

Slides—Designed to allow easy movement of chairs, tables and other furniture, eliminating chatter, vibration and noise. A real necessity in classrooms and offices. There is a size for every installation. Live rubber cushion with annular rings gives resiliency and quietness in use.



No. CG-90 7/8" diam. base | No. CG-91 1 1/16" diam. base | No. CG-92 1 1/4" diam. base

The sharp steel nail drives easily with a hammer — standard finish nickel-plated — furnished also in oxidized copper or special finish where required.

No. CG-93
1 1/2" diam. base

MACHINE SCREW ATTACHMENT

Any of the above sizes also can be furnished with 8/32" threaded machine screws with 3/8" projection above the rubber.

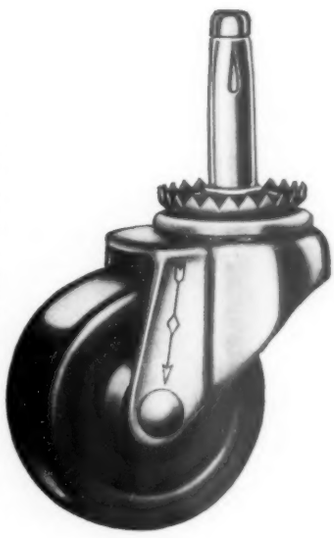
GRIPNECK PINTLES

Bassick Rubber Cushion slides are also furnished with pintles to fit standard 3/8" Gripneck sockets for wood furniture.

No. CG-392—1 1/4" base
No. CG-393—1 1/2" base

DIAMOND ARROW OFFICE CHAIR CASTER

The highest quality caster for office chairs. New patented ball bearing construction gives this office chair caster maximum efficiency and great strength at economical cost. Rubber tread wheels for linoleum, tile, cement or hardwood floors. Solid tread composition wheels for rugs or carpets. 1 5/8" and 2" wheel diams.



DOUBLE WHEEL DIAMOND ARROW INSTITUTIONAL PIANO CASTER

This caster is a necessity for pianos that must be moved frequently. Double wheels, either rubber or solid composition tread, provide protection to floors and quiet operation. Bassick Diamond Arrow ball bearing construction assures easy swiveling. Low overall height is combined with extreme strength.

The items illustrated on this page are samples from the complete line of thousands of sizes and types of Bassick casters.

For complete information, please write:

THE BASSICK COMPANY

Bridgeport, Connecticut

BUCKEYE GLIDE COMPANY, INC.

DEPT. AS–38

131 East 23rd Street, New York City, N. Y.

NOISELESS FURNITURE GLIDES

Quiet Moving on All Floors, Including Stone

FOR EVERY TYPE CHAIR — DESK — TABLE, ETC. — WOOD OR METAL

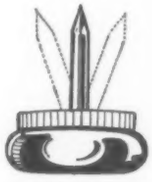
Cut showing the Vibration Absorbing construction of the Spring - Kushion Noiseless Glides.

●

CHAIR SIZE

For chairs, and light tables. Also for other light weight furniture.

To attach simply hammer on tight.



No. 136 Type N 7/8" dia. Nail on Glide

●

No. 206 Type N 1¼" dia. Nail on Glide

HEAVY FURNITURE SIZE

For heavier furniture such as settees, Morris and other heavy chairs, desks, benches, large tables, couches, etc.

FOR METAL FURNITURE

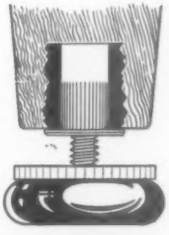
Type B

Type B: Fitted with threaded shank for use on metal furniture. Nuts and lock washers supplied.

Type DS: Fitted with hardened thread cutting shank. Plain hole in the metal and these glides drive in. No threading necessary. Hold on metal 1/8" or thicker.

Both types made in two sizes:

No. 136 size 7/8" dia.
No. 206 size 1¼" dia.



No. 206 Type A 1¼" dia. Anti-wobble Glide. Adjustable in height

●

WILL STOP ALL WOBBLE WILL LEVEL FURNITURE

This glide will take the wobble out of any Dining Room Table.

A turn of the glider head is all that is necessary to steady the table.

FOR • SILENT • MOVING • SCHOOL • CHAIRS

Spring-Kushion Glides can be used on any type of floor.

Terrazzo, Composition, Wood, Tile, Linoleum, Rugs, Carpets, Concrete and STONE.

Spring-Kushions take up all vibrations within themselves, and impart an ease of motion to furniture that is entirely new.

This easy motion takes strain from chair frames and seats and makes for longer chair life.

The glides are all solidly built of hardened steel, are polished and nickeled. The shells are harder than a steel file. Within is the tempered steel spring which assures perfect contact of the shell to the floor at all times.

A pure rubber cushion and the attaching pin complete the assembly.

The shells of all Spring-Kushions are flat, to insure greatest bearing surface and to avoid denting of linoleums, etc.

SAMPLES ON REQUEST

THE AMERICAN SCHOOL AND UNIVERSITY

FAULTLESS CASTER CORPORATION

DEPT. SU-37

Evansville, Indiana

REPRESENTATIVES IN PRINCIPAL CITIES — CANADIAN FACTORY: STRATFORD, ONTARIO

DOUBLE BALL BEARING CHAIR CASTERS

In the office, the library, the study rooms, Quiet is a golden virtue. Faultless Casters are designed for quiet, smooth operation. Faultless Casters swivel quickly and with minimum effort. For the user, they make possible greater efficiency and contentment. Sturdy construction assures years of economical service. The special double ball bearing swivel caster featured here is finished in oxidized copper to harmonize with any furniture.

Notice the double row of polished and specially hardened ball bearings which assures quick swiveling, effortless movement and absolute quiet. The wide shoulder with center of gravity offset at such great distance from the wheel is another Faultless feature that makes for positive swiveling. Dust proof construction.

Packed in 1 Set Individual Display Carton with Sockets, Copper Oxidized Finish

RUBEREX (Cushion Tread) WHEELS

Style Number	Wheel Dia.	Wheel Bearing	Height, Floor to Track Plate
2478	1⅝	Plain	2⅛
2479	2	Plain	2½
BG2257-8	1⅝	Ball	2⅛

ROCKITE (Hard Tread) WHEELS

Style Number	Wheel Dia.	Wheel Bearing	Height, Floor to Track Plate
2778	1⅝	Plain	2⅛
2779	2	Plain	2½
BG2857-8	1⅝	Ball	2⅛

FAULTLESS CUSHION CHAIR GLIDES

Faultless Cushion Chair Glides give double protection. The live rubber insulation protects against jars and vibration; the smooth rounded edges of the glide protect floors from being marred.

Faultless Cushion Chair Glides are offered in four sizes. They are sturdily built of formed hardened steel and will outwear the chairs on which they are used. They are finished in oxidized copper to harmonize with any style of furniture.

Packed in 1 Set Individual Display Carton, Copper Oxidized Finish

FLEXIBLE CUSHION CHAIR GLIDES

Number	Diameter Base
NRS	⅞"
NRS	1 1/16"
NRS	1¼"
NRS	1½"

CUSHION CHAIR GLIDES WITH MACHINE SCREW ATTACHMENT

Number	Diameter Base
SRS	⅞"
SRS	1 1/16"
SRS	1¼"
SRS	1½"
SRS with nut	⅞"
SRS with nut	1 1/16"
SRS with nut	1¼"
SRS with nut	1½"

CUSHION CHAIR GLIDES WITH SPRING CLIP SOCKET FOR METAL TUBING

Number	Diameter Base	Approx. O.D.
	For Round Tubing	
ORS	⅞"	⅞"
ORS	1 1/16"	⅞"
ORS	1 1/16"	1 "
ORS	1¼"	1 "
ORS	1½"	1 "
	For Square Tubing	
ORS	1 1/16"	1 "
ORS	1¼"	1 "

When ordering ORS Glides specify outside diameter of tubing and whether socket is wanted for round or square tubing.

FAULTLESS FURNITURE CUPS

Packed in 1 Set Individual Display Carton

SQUARE ROCKITE OR RUBEREX FURNITURE CUPS

Number	Size of Opening	Weight Per Set
SDC 1½	1½"	6 Oz.
SDC 1¾	1¾"	7 Oz.
SDC 2	2"	13 Oz.
SDC 2⅝	2⅝"	15 Oz.

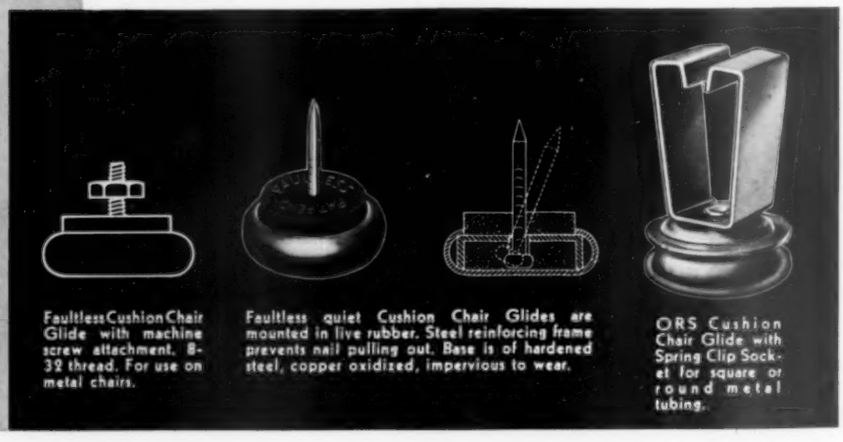
ROUND ROCKITE OR RUBEREX FURNITURE CUPS

Number	Diam. of Opening	Weight Per Set
RDC 1⅜	1⅜"	5 Oz.
RDC 1⅝	1⅝"	7 Oz.

Be sure to specify whether Rockite (hard) or Ruberex (Cushion) is wanted when ordering.

Faultless Ruberex (cushion) or Rockite (hard) Furniture Cups, for stationary heavy furniture are made of non-breakable, rustproof composition, in a harmonizing brown shade that will not lose color.

Unless otherwise specified, Rockite Furniture Cups will be supplied.



Faultless Cushion Chair Glide with machine screw attachment. 8-32 thread. For use on metal chairs.

Faultless quiet Cushion Chair Glides are mounted in live rubber. Steel reinforcing frame prevents nail pulling out. Base is of hardened steel, copper oxidized, impervious to wear.

ORS Cushion Chair Glide with Spring Clip Socket for square or round metal tubing.

CHAMPION DISH WASHING MACHINE CO.

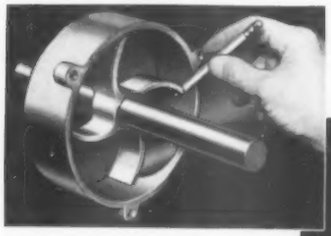
MAIN OFFICE AND FACTORY

Erie, Pennsylvania

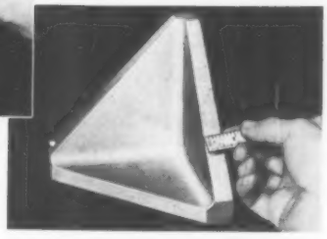
The advantages of using CHAMPION Dish Washing Machines:

(a) FASTER THOROUGH WASHING, due to the pressure-plus-volume washing action, forceful, direct sprays reaching the dishes without obstruction.

(b) LOWER OPERATING COST. The CHAMPION'S non-clog pump has only two bearings instead of 6 or 7. Simplest mechanism—uses less power.



Full ¼" clearance all around impellor—pump does not clog or need constant inspection and cleaning



Heavy cast-iron tank, ½" thick: ten times thicker than an ordinary sheet metal tank

(c) LOWER MAINTENANCE COST. "Lifetime" tank used in CHAMPION does not need replacement or repair; good as new after 25 years or more. The non-clog pump, with a full ¼" clearance all around the impellor, does its work year after year without even an inspection. The machine's more rigid construction eliminates vibration.

OTHER SUPERIORITIES will be found all over the CHAMPION—the results of fifty years of exclusive specialization in dish washing equipment.

ALL SIZES, ranging in capacity from 2,500 pieces per hour to 21,000 pieces per hour.

ANY TYPE OF FEED—hand feed, rack type; automatic feed, rack type: and the belt conveyor type. You can meet the exact requirements of your installation.

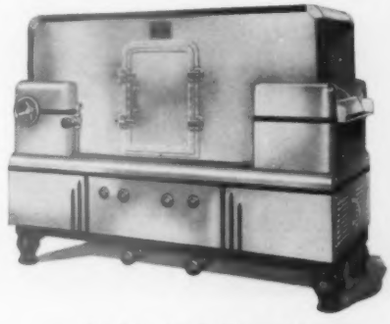
PROVED BY RESULTS. Our long list of school and university installations will enable you to get, direct from the users, data on the CHAMPION'S more thorough washing and more economical operation.

HELP IN PLANNING is given by our engineering department, without the least obligation. Experience from thousands of past installations will be useful to you, and is at your command. We shall be glad to discuss your needs either by mail or through a representative. Write us for full details on any or all models.

A. I. A. DIMENSION PRINT FOLDER will be useful to architects.

Model 1-SD4 Champion
Rack Type for Hand Feed

Model 20-B Champion
Rack Type for Automatic Feed



Model 400-B Champion
Conveyor Belt Type

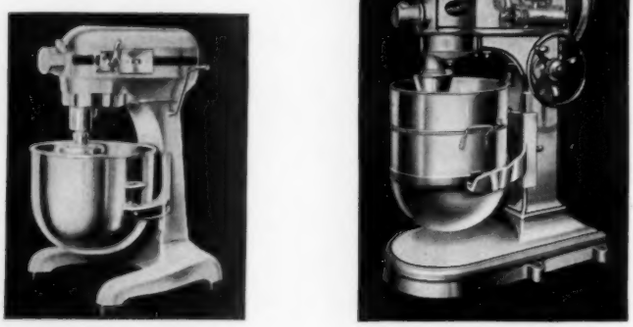
THE HOBART MANUFACTURING CO.

Makers of Electric Food-preparing and Dishwashing Machines

Troy, Ohio

New York Office, 71 Madison Avenue
SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES

Chicago Office, 61 Wacker Drive
SOLD THROUGH LEADING KITCHEN OUTFITTERS



Left—Hobart 20-12 Qt. Mixer, Bench Type. The Equivalent of Two Mixers. Handles Wide Range of Duties in 20 Qt. and 12 Qt. Bowls. Right—Hobart M-80 Super Mixer with Bowl Capacity Up to 110 Qts.

HOBART MIXERS are built in 3, 5, 10, 12, 15, 20, 30, 40, 60, 80 and 110-quart Bowl Capacities. A model for any size kitchen. They mix, beat, whip, blend, mash. With attachments they chop, grind, slice, shred, grate, crumb, sieve, strain, etc.

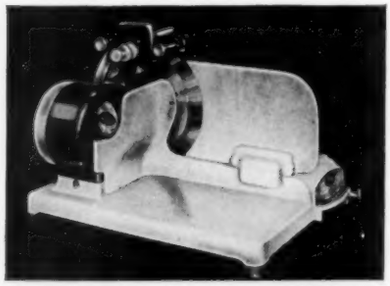
The Air Whip Attachment, for Hobart Mixers only, adds even more to the value of these machines. Supplies aerating advantages important in cake making, improving texture, taste and keeping quality.

HOBART-CRESCENT GLASS AND DISHWASHERS are made in a wide range of automatic and semi-automatic models to meet the demand for any capacity. They give sparkling cleanliness and a high degree of sterilization. Noted for such exclusive features as revolving wash arms and patented Dual-Drive conveyor. Also complete line of Brush Type Glasswashers.

Hobart-Crescent Dishwashers: Left—New Model "LM," Compact, Low-priced, Heavy-duty Unit for Busy Kitchens. Center—Model "AM-5." Right—Fully Automatic "XM-2" with Dual-drive Conveyor

THE HOBART ELECTRIC KITCHEN SLICER AND CARVER combines the newest, most improved features in one machine. Ideal for boneless meats, raw or cooked, bread, cheese, vegetables, fruits, etc. Convenient to operate; speedy, quiet, safe and easy to clean. New Model in black and white Dulux, with Hobart STAYSHARP STAINLESS STEEL KNIFE.

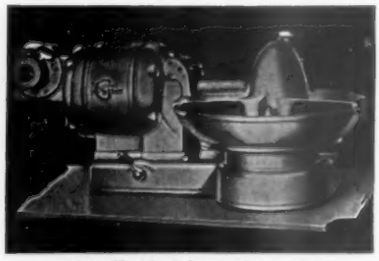
THE HOBART AIR WHIP makes 3 or more quarts of whipped cream from 1 quart of liquid cream in a few seconds. Whips by Air, keeping all the freshness and sweetness of the cream. More and better whipped cream at less cost.



Model 110 Kitchen Slicer and Carver in Beautiful, Sanitary, Black and White Dulux, with New Hobart STAYSHARP STAINLESS STEEL KNIFE

The Hobart Air Whip Unit Revolutionizes Cream Whipping

Potato Peeler



Small Model Food Cutter

HOBART POTATO PEELERS are made in 3 sizes, Bench type as shown above (left) and floor models with capacities from 15 to 45 lbs. peeled in "no time." Negligible peel loss. Can also be used for sweet potatoes, carrots, parsnips, turnips, etc.

HOBART FOOD CUTTERS, with latest features, cut meats, vegetables, fruits, nuts—practically anything in the food line, uniformly, in a few seconds' time.

GUARANTEE AND SERVICE. Hobart Machines are built by the World's Largest Manufacturers of Electric Kitchen Machines—even to the motors. An advantage to the kitchen standardizing on Hobart Equipment is that all Hobart Machines are guaranteed and serviced by one nationwide organization. This saves uncertainty, inconvenience and confusion. Further particulars on request without obligation.

ALBERT PICK CO., INC.

Engineers, Designers and Manufacturers of School Cafeterias and Kitchens

2153 Pershing Road, Chicago

FOR years at the head of its class, Pix School Cafeteria and Kitchen Equipment passes every examination with highest honors . . . whether it's in economy of operation, sturdiness of construction or attractiveness of design. It is planned and built by experienced technicians to give many years of efficient and uninterrupted service.

You will find Pix Cafeterias in schools throughout the country—we have built all kinds of them . . . to suit all sorts of conditions . . . for a good many years. To each new plan we bring a wide experience with student-feeding problems, a thorough understanding of modern food service methods and a skill in fitting the needed facilities within the confines of any reasonable budget.

In dealing with Albert Pick Co., Inc., you have a definite assurance that the equipment you buy is not only designed and built properly for its job,—but also that specifications are scrupulously followed in every detail . . . that every finished piece is honest in conception and honest in execution. We have been in business for more than three-quarters of a century and our reputation is based on a policy of delivering equipment that is built to last . . . rather than made merely to sell at a low price!

Some of the Schools with Cafeterias Built by PIX

Thornton Township High School Harvey, Ill.
Henderson Grade School ..... Henderson, N. C.
Augustana College and Theological Seminary ..... Rock Island, Ill.
Hillsboro High School ..... Hillsboro, Ohio
Purdue University, Cary Hall East ..... Lafayette, Ind.
Louisiana Polytechnic Institute. Ruston, La.
McKinley High School ..... Chicago, Ill.
Owensboro Public School ..... Owensboro, Ky.

Above—
Lake View High School, Chicago

Right—
Lew Wallace High School, Gary, Ind.

Below—
Lindbloom High School, Chicago

School Executives and Their Architects Are Invited to Make Full Use of our Engineering and Consultation Staff

Without cost or obligation, Pix engineers will gladly discuss your student feeding problems, suggest proper equipment, estimate costs . . . whether you are interested in inexpensive equipment or Deluxe construction . . . whether in modernizing present facilities, planning a new installation or single pieces of cafeteria or kitchen equipment.

REPUBLIC STEEL CORPORATION

Alloy Steel Division: Massillon, Ohio General Offices: Cleveland, Ohio

BERGER MANUFACTURING DIVISION—UNION DRAWN STEEL DIVISION
NILES STEEL PRODUCTS DIVISION
STEEL AND TUBES, INC.—TRUSCON STEEL COMPANY

ENDURO

REPUBLIC'S PERFECTED STAINLESS STEEL

ENDURO Stainless Steel is ideal for coffee urns, steam tables, counter tops, slide rails, shelves and decoration in cafeterias

ENDURO Stainless Steel is an unusually versatile metal. It is beautiful, strong, sanitary, long-lasting and economical in the long run. Because of its many advantages it is being widely used in schools, colleges and universities for kitchen and cafeteria equipment, utensils, laboratory furniture and equipment, laundry equipment, sinks, dishwashers, toilet partitions, stairway railings, kick plates, hardware, hoods, ducts, cabinets, shelving, lighting fixtures, grilles, spandrels and other ornamental and practical applications.

In the polished state, ENDURO is a beautiful, lustrous silvery-white metal that retains its fine appearance indefinitely. It is a solid metal, resistant throughout to rust and corrosion. It is unaffected by weather and is resistant to most acids, alkalies, fumes, foods and dairy products. It is stronger than ordinary steel—resistant to hard service and abuse.

ENDURO is ideal for kitchen and cafeteria equipment and for utensils. It is neither affected by foods, fruits, vegetables and dairy products nor does it in any way affect their flavor, odor, color or composition. Because of its low heat conductivity, it will hold heat longer than other metals used for cooking. ENDURO is non-porous, clean and sanitary. Wiping with a damp cloth or an occasional washing restores the original silvery finish.

ENDURO Stainless Steel now in use in schools, restaurants, cafeterias, hotels, hospitals, laboratories and elsewhere is proving its economy through long life and reduced maintenance costs.

Leading manufacturers and fabricators use ENDURO for all types of equipment. Full information, together with names of fabricators in your territory will be sent upon request. Please address Dept. A. M.

A "shining" example of cleanliness, efficiency and economy in kitchen equipment—made of ENDURO Stainless Steel

ENDURO Stainless Steel, because of its high resistance to corrosion and its ease of cleaning, is being used in all types of laboratories

NATHAN STRAUS-DUPARQUET, Inc.

Sixth Avenue, Eighteenth to Nineteenth Streets, New York City

Telephone: WAtkins 9-5200 Cable Address: "STRAUS," New York

DUPARQUET, HUOT AND MONEUSE CO.
BOSTON: 491 ATLANTIC AVENUE

DUPARQUET RANGE CO.
CHICAGO: 225-235 NORTH RACINE AVENUE

A RELIABLE SOURCE OF SUPPLY

Kitchen Equipment and Installations, Utensils, China, Glassware, Silverware, Furniture, Linen, Beds, Bedding

Section of Kitchen Equipment Department, New York Showrooms

UNIVERSITY AND SCHOOL EXECUTIVES

WHATEVER the capacity of your educational institution, we can be of service to you in providing equipment for cooking, baking, warming and serving food. Our experience goes back over a period of 100 years. Since 1838 we have furnished equipment and supplies for thousands of kitchens. Duparquet ranges and special kitchen apparatus have had long years of recognition as the highest in quality and the most durable in their particular field.

Nathan Straus-Duparquet kitchen equipment has been installed in many of the finest modern schools and colleges in the United States. The roster of these is too long to quote here, but we mention Fordham University, Dartmouth College, University of Notre Dame, Taft School, Mt. Holyoke College, Phillips Exeter Academy, Bronxville High School, N. Y., Bellmore High School, N. Y., as examples of our work.

In these and in many similar institutions, we have worked out kitchen plans in conjunction either with the architects or executives. Our large and experienced engineering staff is available for assistance and cooperation in the preparation of kitchen installation plans. When you have an equipment problem to solve, we will be glad to have you call on us for discussion, plans and estimates.

Our Supply Department covers the entire range of items needed for service and operation — China, Glassware, Silverware, Kitchen Utensils and Equipment, Furniture, Refrigerators, Linens, Bedding. We carry very large stocks and are prepared to give prompt deliveries as required.

Write us about any individual items of equipment or supplies that may be required. We will be glad to send you full information and estimates.

WRITE FOR A FREE COPY OF OUR CENTENNIAL CATALOG

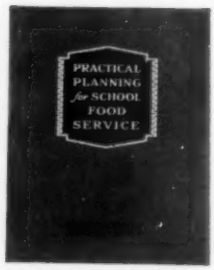
It is a veritable encyclopedia for purchasers of food service equipment. It contains 2600 illustrations. Every executive responsible for School or College food service should obtain a copy

THE JOHN VAN RANGE CO.

535–555 Culvert Street, Cincinnati, Ohio

When THE JOHN VAN RANGE CO. equips a school lunch room or kitchen, it is not acting simply as a manufacturer but as a trained service organization. Our corps of food service specialists, engineers and technical experts constitute a service staff which is in position to handle the complete **planning and installation** of everything necessary to transform the bare rooms into complete cuisines and dining rooms ready for operation.

Throughout our connection with the project and **particularly in the early planning stages,** the experienced counsel of our executives and specialists is available in connection with matters such as organization, operation, space requirements, proportioning of facilities, preparation of preliminary plans, etc. We have acted in this capacity in connection with many of the country's largest installations.



This 32 page book has been prepared for educators and architects who are planning a new school or are considering a major alteration of existing food service. Mail requests to 535-555 Culvert Street, Cincinnati, Ohio

In undertaking the creation of a school lunch room or kitchen, there are certain architectural and engineering problems involved in food service planning. The **food service policy** must be determined: whether the general system of operation shall be as an independent department of the school or as an integral part of the Home Economics Department; whether all students shall use one dining room or shall be separated by sex, age, or other distinctions; the rotation of lunch periods to increase seating capacities; the general arrangement of menus and of distribution of food, the use of dining rooms for other functions, such as study halls or assembly halls, relationship to the building plan, and provision for future expansion.

Other factors which need similar exhaustive study are those affecting **location in the building plan;** important decisions on **kitchen engineering and plan organization;** adequate food storage facilities; **sanitation; elimination of kitchen noises; structural requirements of the building; dining rooms for faculty;** auxiliary requirements of the kitchen, arrangement of service counters; sandwich dispensaries; candy and ice cream sales; **selection of kitchen and dining room equipment and utensils.**

It is important to note that complete analysis **precedes** planning, and that planning precedes any recommendations as to specific equipment required. This is a principle of John Van engineers whether the problem is a complete kitchen and lunch room or a single piece of equipment. With such study as a foundation, with the experience of hundreds of such installations as a background, our engineers prepare complete plans, layouts and specifications for the lunch rooms or cafeterias, kitchen, refrigerators, for the home economics rooms in coordinated systems, store rooms, and all other related departments, providing the superintendent of schools or the architect with the necessary data concerning plumbing, wiring and steam fitting connections, and for lighting, sanitation, ventilating and other vital matters.

THE JOHN VAN RANGE CO.'s position of leadership in the kitchen equipment industry extends back through almost a century of competent performance and honorable dealing. Its service organization combines technical expertness with generations of practical experience. Thousands of the most representative schools and colleges are John Van equipped.

No matter how large or small the kitchen engineering problem, the John Van organization welcomes the opportunity to cooperate wherever questions of food service equipment are involved.

The illustration opposite shows the kitchen and cafeteria in the new Student Union Building at the University of Cincinnati, which was opened in October, 1937. In planning the equipment and arrangement of both the kitchen and cafeteria counter, the services of John Van engineers were advantageously employed. This installation illustrates the thoroughness with which the John Van engineers provide for every detail. Whether your school is in the planning stage, or shows glaring evidences of inefficient arrangement (worn out or obsolete equipment, high fuel bills, chilled food in the serving counter, etc.) in your existing operation, it will not cost you a penny and may save you hundreds of dollars to obtain John Van's analysis and recommendations.

Careful engineering presupposes equally diligent manufacture. Once your specifications are completed, the matter of actual purchasing would seem simple. **Oddly enough, though, here is the very place where the school lunch room and kitchen go farthest wrong! For in almost all instances, bids are received on school installations which are not based on the quality originally specified at all!** There is no yardstick of quality because kitchen equipment is not of standardized design. Furthermore, the actual life and value of much of the equipment is determined by things which cannot be detected superficially. For example, the difference in appearance between sinks made of light gauge galvanized iron riveted together and those constructed of heavy rust-resisting steel, welded into a single piece and galvanized afterward, is so slight that it is easy to overlook. The latter is so far superior, however, that a price comparison is almost meaningless. **Know** what you are buying and **know** the integrity and ability of the manufacturer. More important than modern machinery is the skill of Van craftsmen, whose artisanship is reflected in every piece of Van equipment. When you buy Van equipment, you are assured that your school lunch room will always display "That Enduring Quality" which has been the Van mark of distinction since 1853.

TYPICAL VAN-EQUIPPED SCHOOLS

Lane Technical High School	Chicago, Illinois
Brooklyn Technical High School	Brooklyn, N. Y.
Boston Public Schools	Boston, Mass.
Cincinnati Public Schools and University	Cincinnati, Ohio
Central and Eastern Senior High Schools	Lynn, Mass.
Caddo Parish Schools	Shreveport, La.
Atlanta University	Atlanta, Ga.
U. S. Coast Guard Academy	New London, Conn.
Michigan State College Union Building	Ypsilanti, Mich.
Shaker Heights High School	Shaker Heights, Ohio
University of Texas	Austin, Texas
University of Colorado	Boulder, Colo.
University of South Carolina	Columbia, So. Car.
University of North Carolina	Raleigh, No. Car.
University of West Virginia	Morgantown, W. Va.
Hunter College	Bronx, New York City
Purdue University	Lafayette, Ind.
Holy Cross College	Worcester, Mass.
Duke University	Durham, N. C.
Principia Academy	St. Louis, Mo.

Kitchen, Student Union Building, University of Cincinnati

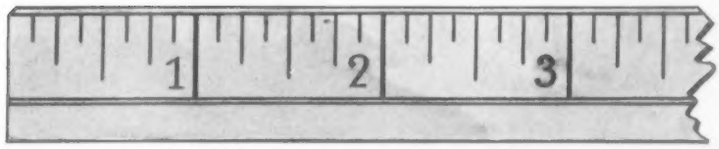
JOHN SEXTON & COMPANY

Manufacturing Wholesale Grocers

Importers Coffee Roasters

Edelweiss Quality Foods

Chicago _____ Brooklyn



The Standard of Comparison

CHICAGO PLANT

John Sexton & Co., welcomes comparison with any other food supply service for those who feed many people each day. Check the following facts about Sexton and Sexton service with the corresponding facts about any other similar service.

	SEXTON SERVICE	ANY OTHER SERVICE
1.	Established in 1883—continuously under Sexton management.	1. _____
2.	Responsibility—the highest.	2. _____
3.	Superb Service—Daily delivery New York and Chicago. All orders shipped within 24 hours of receipt.	3. _____
4.	Coffee Merchants for over 50 years. Direct importations—daily roasting—a saving to you in every pound.	4. _____
5.	All fruits and vegetables selected according to Sexton specifications. Uniform number of servings to the tin. All cans chock-full of fully ripened and delicious fruits or vegetables.	5. _____
6.	A complete variety of high quality preserves and jellies, gelatine desserts, extracts, baking powder made in Sexton Sunshine Kitchens.	6. _____
7.	Sexton pickles, rich in Oriental spices, pickled in pure vinegar and crystal cane sugar in Sexton Sunshine Kitchens.	7. _____
8.	Pre-eminent importers of Spanish olives—save buyers one profit.	8. _____
9.	Tender leaf teas imported from the Tea Gardens of Japan and India. Sexton teas retain the full volume of essential oils and theine found in the blossomed leaf.	9. _____
10.	A large staff of thoroughly trained salesmen, experienced with the needs of those who feed many people each day. A Sexton representative in every state in the Union.	10. _____
11.	Endorsed by the National Associations of the various enterprises feeding many people each day.	11. _____
12.	The Sexton guarantee of complete satisfaction or money cheerfully refunded accompanies every sale.	12. _____

BROOKLYN PLANT

If you are among the vast number of Sexton patrons, you have proved already the convenience and economy of these and other features of Sexton service. From all others we invite a trial order, the severest test you can make

PYROFAX DIVISION

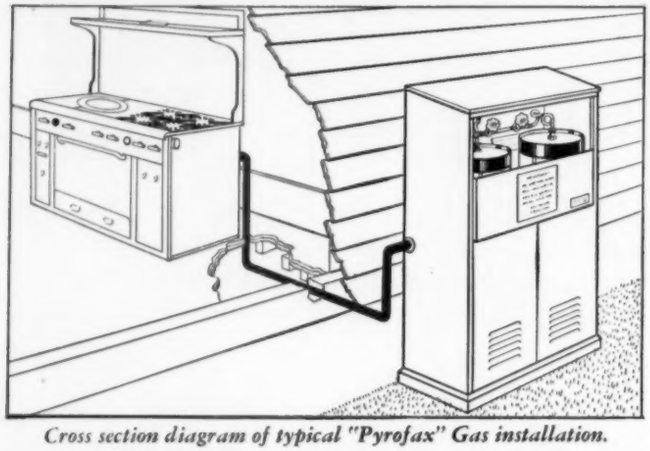
CARBIDE AND CARBON CHEMICALS CORPORATION

30 EAST 42nd STREET, NEW YORK, N. Y.

•

PYROFAX GAS FOR COOKING BEYOND THE GAS MAINS

"Pyrofax" Gas is real gas, not a liquid fuel, and burns just like city gas; it enables institutions of all kinds to have the convenience and economy of city gas service even though they're located beyond the gas mains.



Cross section diagram of typical "Pyrofax" Gas installation.

Simple, reliable equipment. The equipment is simple, reliable and fully automatic. As the illustration shows, the "Pyrofax" Gas regulating equipment, which is placed out of doors, accommodates two cylinders of gas and a pressure reducing assembly. Gas flows from the cylinder in use to the regulator where pressure is reduced to six ounces, then through seamless copper tubing to the kitchen. The "Pyrofax" Gas two-cylinder system (one cylinder in use, one in reserve) assures uninterrupted service. Each cylinder of "Pyrofax" Gas when used with properly adapted ranges produces usable heat equivalent to approximately 5700 cubic feet of manufactured gas.

Supply guaranteed. Future supply of "Pyrofax" is guaranteed by one of the oldest and largest manufacturers of compressed gases in the world. The strategic location of more than 300 gas warehouses throughout the country enables "Pyrofax" Gas distributors to make prompt gas deliveries anytime, anywhere and in any weather. Each "Pyrofax" Gas user is assured the individual attention of these expert local distributors and their trained service men... which means uninterrupted supply and trouble-free operation.

Widely used. "Pyrofax" Gas Service is used by hundreds of schools and universities in kitchens, laboratories and infirmaries. It is clean, fast, inexpensive, reliable. "Pyrofax" Gas provides all the advantages of city gas.

New Hampton School, New Hampton, N. H.

Read what Headmaster Smith of New Hampton School says about "Pyrofax" Gas:

> "The new units have cut our costs very much during the last year...We feel that we save the cost of 'Pyrofax' Gas several times during the school year by the increase in efficiency of our kitchen."

Magic Chef Heavy-Duty Cooking Equipment for Use with "Pyrofax" Gas. Magic Chef cooking equipment adapted for "Pyrofax" Gas can be supplied to perform every large scale cooking operation. Complete stove units ranging from one-burner hot plates to large capacity battery equipment as well as short order stoves, griddles, deep fat fryers, coffee urns and steam tables are available for use with "Pyrofax" Gas.

This Heavy Duty Cooking Range is typical of Magic Chef equipment for use with "Pyrofax" Gas. It is 48" wide, 34" deep, 32" high. It has half solid and half grate top. Solid top has ring and center burner. Grate top has 4 Giant Magic Chef Burners.

Features. Many new features make Magic Chef the most complete and serviceable of all commercial cooking equipment:

- Non-clog giant burners
- Non-sagging block insulation
- Uniform heat top
- High-speed burners
- Cool tubular oven handles
- Extra heavy cooking top
- Convection ovens
- Lorain Red Wheel oven heat regulator
- Removable burner trays
- Porcelain-enamel oven lining

Your nearby "Pyrofax" Gas Distributor has been chosen for his ability to render reliable and efficient service at all times. For his name and address write to Pyrofax Division, Carbide and Carbon Chemicals Corporation, 30 East 42nd St., New York, N. Y.

"Pyrofax" is the registered trade-mark of Carbide and Carbon Chemicals Corporation

BOSTON
NEW YORK
PHILADELPHIA
ATLANTA
CLEVELAND

EDISON-HOTPOINT

EDISON GENERAL ELECTRIC APPLIANCE CO., INC.

5600 W. Taylor St., Chicago, Ill.

MINNEAPOLIS
KANSAS CITY
DALLAS
SALT LAKE CITY
SEATTLE
LOS ANGELES

"World's Oldest and Largest Makers of Commercial Electrical Cooking Equipment"

1500 meals a day—over one-half million meals a year! Edison equipment was chosen to do the cooking job for the California Hospital, Los Angeles

MILLIONS OF MEALS

Millions of meals are being **electrically** cooked each day in America's homes, institutions, schools, hospitals, and commercial establishments.

A substantial majority of these meals are cooked on Edison Commercial and Hotpoint Domestic Electric Appliances.

There is a sound reason behind both these statements of fact. It is the only economic basis for the purchase of cooking equipment.

EDISON - Hotpoint equipment produces BETTER FOOD at LOWER COST!

MAKE *YOUR* FOOD BUDGET GO FARTHER

THE hundreds of institutions, hospitals and schools using Edison-Hotpoint Commercial Cooking Equipment today have proven that the advantages of **electric** cooking are reflected in black figures in the operating statement.

Fuel cost and equipment costs are minor items when considered in relation to the all important items of patron satisfaction and food and labor costs.

It requires only a minute waste of food or a little additional labor to equal the cost of a single pat of butter. BUT electricity to cook one man-meal costs LESS THAN THE COST OF A PAT OF BUTTER more than the cheapest, old fashioned flame fuel!

Edison-Hotpoint Commercial Electric Cooking Equipment offers a complete line of specialized appliances designed to fit every need.

Edison-Hotpoint alone offers the famous Calrod heating unit, proved by independent test to have SIX TIMES the life expectancy of its closest competitor.

Edison-Hotpoint offers **you** the services of a complete field staff of highly trained food service specialists who have planned and installed hundreds of **successful** commercial kitchens ranging in size from roadside stands to thousand bed hospitals.

Write or call the nearest Edison-Hotpoint District Office for catalog of:

EDISON-Hotpoint
Automatic Electric

Fry Kettles	**Ranges**
Waffle Bakers	**Broilers**
Grills	**Stock Kettles**
Griddles	**Roasting Ovens**
Egg Boilers	**Bake Ovens**
Hot Food Storage Units	**Combination Ovens**

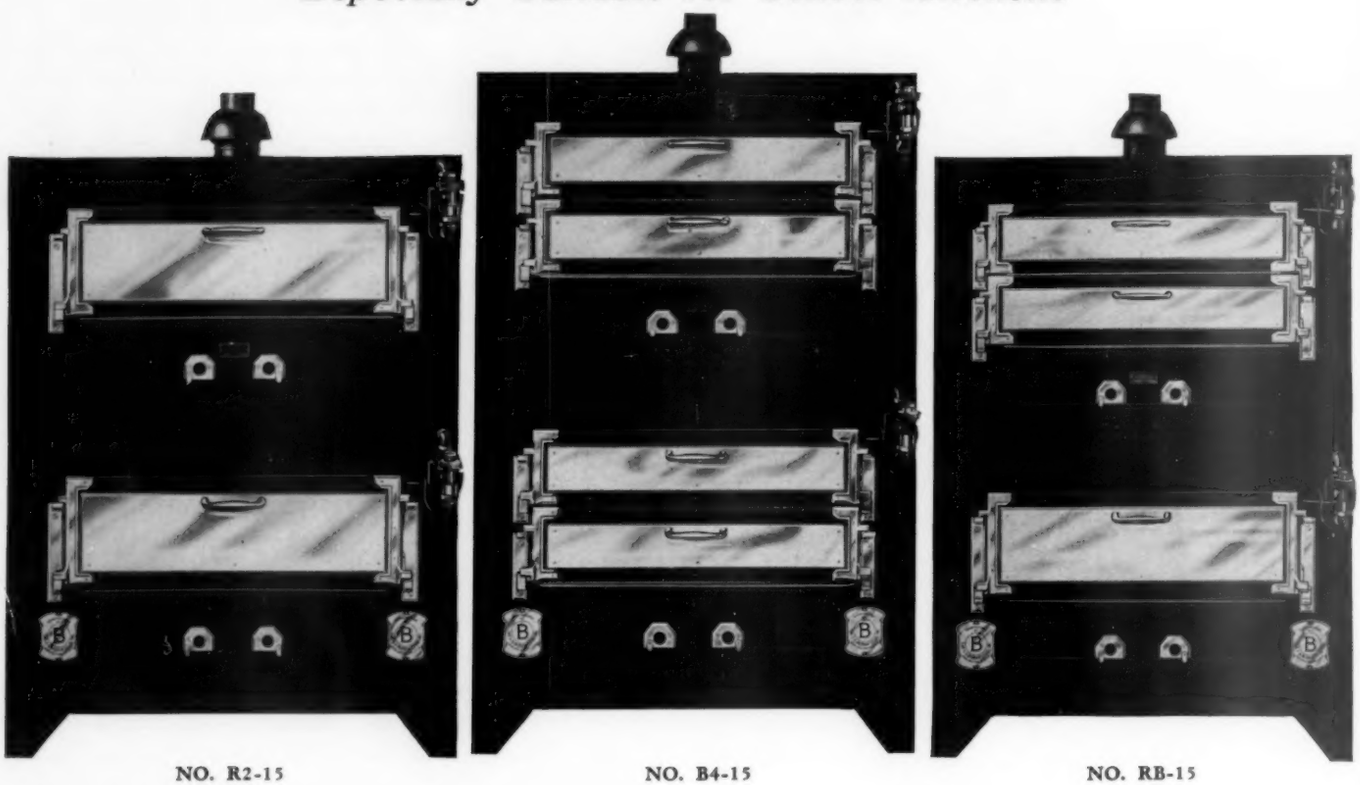
OVER 100 SIZES AND MODELS TO FIT *YOUR* REQUIREMENTS!

Since 1848 **THE G. S. BLODGETT CO., INC.** Since 1848

Burlington, Vermont

BLODGETT'S NEW GAS OVENS

Especially Suitable for School Kitchens



NO. R2-15 NO. B4-15 NO. RB-15

The ROASTER-BAKER Models have two separate compartments in one oven, each compartment with separate gas burners and automatic temperature control

These ovens are built in three types as shown. Each type is built in two sizes. Each compartment may be used equally well for baking or roasting with large or small, high or low pans or pots. The ovens with high compartments are particularly adapted for bean pots, tall dishes, and large or small roasts.

Economy in operation and flexibility in use are the important features of the ROASTER-BAKER Models. Baking or roasting at different temperatures can be done at the same time. This saves the time of the operator who can be using two different oven temperatures, and so be baking or roasting two entirely different products at one time. If there are two bakers, or one baker and one meat cook, each has his own individual oven and each can operate it according to his own needs. Temperatures may be changed quickly to meet a variety of work. Moreover, there are days, and certain hours during a day, when baking or roasting requirements are light, consequently only one compartment of a ROASTER-BAKER Oven need be used and so one-half the gas is saved.

The distribution of heat can be controlled more evenly because the baking compartments are smaller in area. The result of this inherent advantage of the ROASTER-BAKER Model is better, more uniform, and time-saving baking and roasting.

Today the usual kitchen planning calls for a battery of ranges primarily installed to furnish top cooking area for short order work. But these ranges are always furnished with ovens for roasting underneath this top cooking area. Such ovens are inconvenient to work on, necessitating bending and stooping to load and unload heavy roasts.

A Blodgett ROASTER-BAKER Oven located in a small floor space away from the area in front of the ranges, relieves congestion and confusion, saves time and tempers, and guarantees improved service at minimum operating costs.

CONTROL YOUR COOKING OPERATIONS

Save with *GAS*—the Better Fuel

JOHN E. SMITH'S SONS COMPANY

50 Broadway, Buffalo, N. Y.

Manufacturers of BUFFALO Food Cutters, Meat Choppers, Vegetable Slicers and Bread Slicers

"Buffalo"

FOOD CUTTERS

Every school kitchen, from the smallest to the largest, can save considerable time and money by the installation of suitable mechanical equipment. **Buffalo Food Cutters** are made in models and sizes to meet the requirements of kitchens large and small in schools, hotels and restaurants; and thousands have been in daily operation for years, giving speedy, economical and trouble-free service. In not one, but hundreds of ways, these machines have been reducing costs, eliminating wastes and spoilage, and saving time and money.

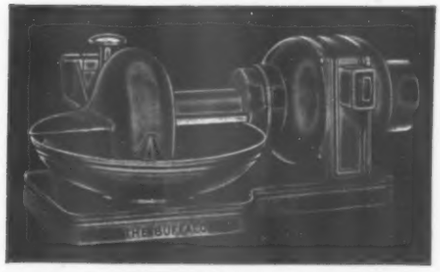
A few of the many uses of the Buffalo that mean lower costs — actual cash savings — in the school kitchen:

Cut meat for croquettes and hash
Cut vegetables, nuts, fruits, for salads
Mince parsley, peppers, mint, spinach
Cut clams for chowder
Cut cabbage for slaw
Cut vegetables for soups
Make codfish cakes
Make bread or cracker crumbs
Make meat loaf
Make sandwich spreads

Grinder and Vegetable Slicing Attachments available for all models include grater plates, shredder plates, vegetable slicers, and meat grinder attachments.

(Left) BUFFALO Model 120 Self-Emptying Food Cutter — (For Large School Kitchens)

This model has not only the same efficient, economical operation for which all Buffalo Food Cutters are famous, but also the additional, exclusive advantage of the self-emptying bowl. A simple device automatically empties the bowl without touching the food. This machine produces better quality chopped foods, eliminates food waste, saves considerable time and labor; is simple, safe, sanitary, easily cleaned. Diameter of bowl, 20 inches. Capacity, 20 pounds of meat. The top plate, but not the bowl, can be removed. The Cutter is powered by a one-horsepower fully enclosed motor.



(Below) BUFFALO Bread Slicer

Automatically feeds the bread to the knife, stacking it as it cuts, keeping it fresh. Cuts 175 to 200 uniform slices per minute. Saves two to three slices on every loaf over hand slicing. Made in three sizes, for hand or motor operation.

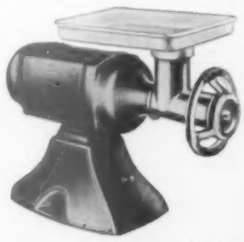
(Left) BUFFALO Model 114 Food Cutter — (For Small School Kitchens). Made in both pedestal and bench types

This model is sturdily built, very efficient in operation, takes up little room, is beautifully finished; has exclusive safety features including well guarded knives. Top plate and bowl are removable. Capacity 7 pounds; ⅓-h.p. motor.

(Right) BUFFALO Vegetable Slicer Model C

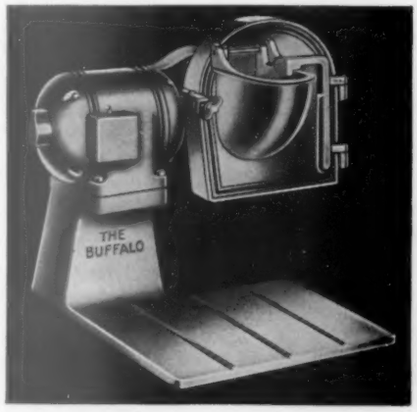
This machine will slice all kinds of vegetables and fruits, grate cheese and bread crumbs, make French fried potatoes, and slice or grate nuts; also make uniformly thin potato chips. It can be equipped with five slicing discs and two different style fronts, as well as with grinder attachment for producing fine-cut hamburger, sausage meat, etc. It has ⅓-h.p. motor.

Write for booklet, "Buffalo Kitchen Machines"



(Left)— BUFFALO Meat Chopper

This machine assures fast, clean-cut operation with no clogging, backing up or mashing of the meat. 5 sizes. Model 412 has capacity of 3 pounds meat per minute; ¼-h.p. motor.



STANDARD GAS EQUIPMENT CORPORATION

18 East 41st Street, New York, N. Y.

Other Conveniently Located Offices at

Boston Philadelphia Baltimore Aurora, Ill. Chicago Los Angeles

MODERN VULCAN GAS COOKING EQUIPMENT
Saves from 25% to 50% in Cooking Costs

Installation in College of New Rochelle, New Rochelle, N. Y., includes Vulcan All-Hot-Top, Fry Top and Open Top ranges, and Ceramic broilers

By actual tests, the Vulcan Radial Fin Top range has reduced the amount of gas needed for top stove cooking 20% or more; its insulated heat controlled oven reduces gas consumption 25 to 50%, as many users will testify.

Due to greater speed and capacity, fewer units are needed, reducing investment. Refrigeration costs drop because insulated ovens reduce kitchen temperature; up-keep costs are lowered. Vulcan equipment actually pays for itself in savings made . . . new installations get the benefit right at the start.

Foods are cooked better because heat of range top and oven can be automatically regulated. In a test, meat shrinkage was reduced 66⅔%, resulting in more servings per roast. The new Vulcan Ceramic Broiler produces broiled foods of a quality heretofore unobtainable, broils 35% faster and uses less gas. New Vulcan automatic deep fat fryers produce more healthful fried foods, and soon pay for themselves in fat, fuel and food saved.

Vulcan manufactures the largest line of gas cooking equipment, including Gas Ranges in six sizes and 30 styles of cooking tops, Ceramic Broilers, Deep Fat Fryers, insulated heat controlled Bake Ovens and Roasting Ovens, boiling, waffle and griddle stoves, hot plates, industrial and urn burners, etc. ASK FOR CATALOG.

Schools and Colleges have been specifying VULCAN for 50 years. Here are a few out of hundreds of installations:

Public Schools	Birmingham, Alabama
Tuskegee Institute	Tuskegee, Alabama
Alexander Hamilton High School	Los Angeles, California
Lincoln High School	Des Moines, Iowa
New Wyandotte High School	Kansas City, Kansas
University of Kansas	Lawrence, Kansas
Louisiana State University	Baton Rouge, Louisiana
Bowdoin College	Brunswick, Maine
Phillips Academy	Andover, Massachusetts
Harvard College	Cambridge, Massachusetts
State Normal College	Moorehead, Minnesota
Phillips Exeter Academy	Exeter, New Hampshire
Princeton University	Princeton, New Jersey
Pratt Institute	Brooklyn, New York
Cornell University	Ithaca, New York
Columbia University	New York, N. Y.
Hunter College	New York, N. Y.
Roosevelt High School	New York, N. Y.
University of Syracuse	Syracuse, New York
U. S. Military Academy	West Point, New York
St. James University	Toledo, Ohio
Girard College	Philadelphia, Pennsylvania
Central High School	Scranton, Pennsylvania
Furman University	Greenville, South Carolina
State Teachers College	Yankton, South Dakota
East High School	Salt Lake City, Utah

GAS RANGES FOR HOME MAKING KITCHENS

We make many gas ranges especially suitable for home making kitchens, under the well-known tradenames of Oriole, Acorn, Vulcan and Smoothtop. They have all the latest developments in gas ranges. . . . Aluminum Speed-Simmer burners, automatic top burner lighters, smokeless broilers, insulated heat controlled ovens, safety oven gas cocks, safety oven racks and others. Many prefer SMOOTHTOP with its closed top and 3-zone top heat.

Submit your problem to us and we will be glad to work with you.

This shows installation in Lawrence High School, Lawrence, L. I., N. Y. Cabinets are placed back to back, alternately with sinks and plain top, with range at one end. Cabinets were built by Excel Metal Cabinet Co., New York

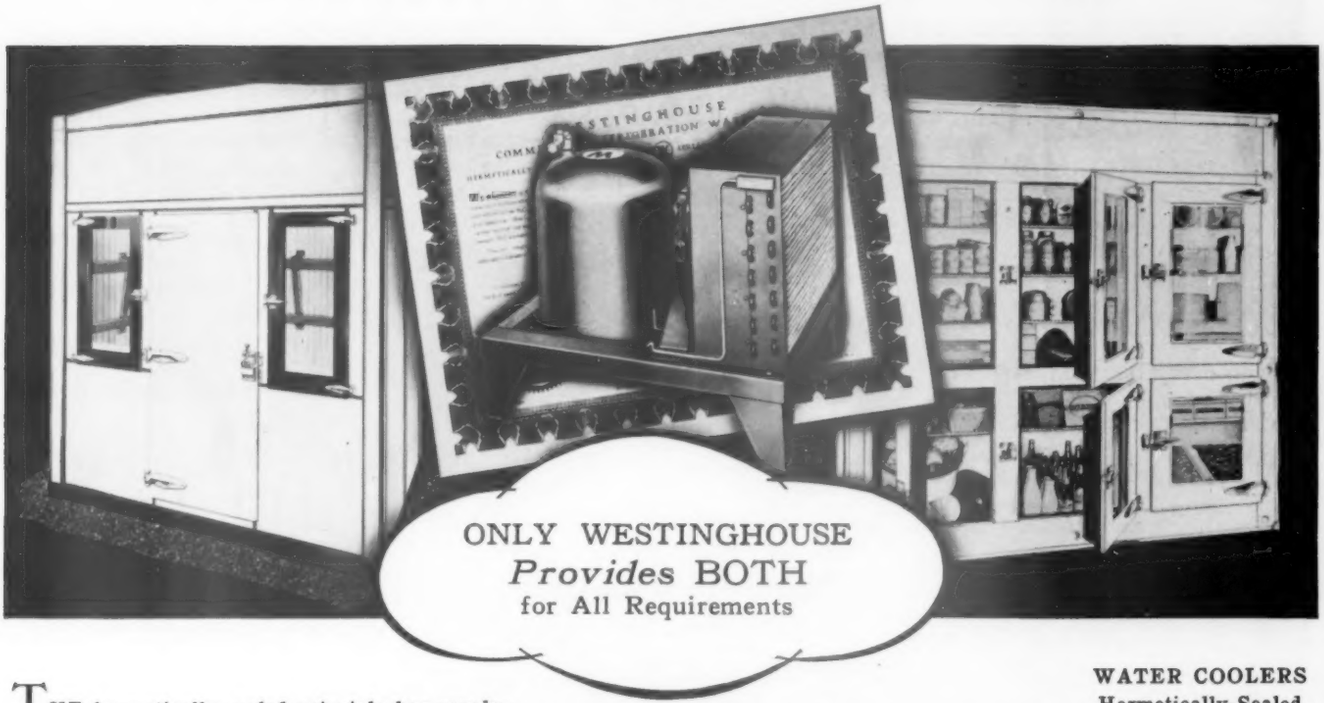
WESTINGHOUSE ELECTRIC AND MFG. CO.

Mansfield, Ohio

Sales, Engineering and Service Facilities
Available Through Branch Offices,
Distributors and Local Dealers

COMMERCIAL REFRIGERATION

Only Hermetically-Sealed Refrigeration
WARRANTS 5 YEARS' PROTECTION



THE hermetically-sealed principle has revolutionized modern refrigeration. It has brought a new conception of economy, of efficiency, of quietness, of dependable, trouble-free performance. Its approach to mechanical perfection has made possible the Westinghouse 5-YEAR PROTECTION PLAN. Westinghouse ***alone*** provides these advantages in commercial refrigeration units for complete hospital requirements.

It will pay you to consider these money-saving advantages of Westinghouse Hermetically-Sealed Refrigeration.

- Power sealed in. Trouble sealed out. Protection against dust, heat and moisture . . . the greatest enemies of precision machinery.
- No attention needed . . . not even oiling. Lifetime supply of oil is sealed in . . . completely protected.
- No belts, pulleys or stuffing boxes . . . conventional sources of trouble.
- Built-in Watchman—guards against overheating. Automatically shuts off unit, then starts it again when danger has passed.
- Powerful, silent motors have no commutators or brushes. Cannot burn out.
- Quiet. Triple mufflers kill noise. Place anywhere without fear of distracting hammering or thumping.
- Automatic unloader valve relieves strain on motor when unit starts.
- Completely water-cooled units permit installations in unventilated places without loss of efficiency.
- Safe refrigerant—Freon is non-toxic, non-inflammable, non-explosive. Also cools faster and more efficiently.
- Speed-air Condenser. High capacity suction fan cools entire mechanism. Increases efficiency. Cuts operating costs.
- 5-Year Protection Plan insures against service expense on sealed-in mechanism. Assures long, low-cost performance.

WATER COOLERS
Hermetically-Sealed

●

For LONGER LIFE

A complete range of models, capacities and prices to meet every requirement.

Call Your Local Westinghouse Dealer, or write
Westinghouse Electric and Manufacturing Company, Mansfield, Ohio

Westinghouse *Hermetically-Sealed* REFRIGERATION

THE ALUMINUM COOKING UTENSIL COMPANY

New Kensington, Pa.

Oakland, Calif.

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"WEAR-EVER" GAS HEATED STEAM-JACKETED KETTLE

This kettle is ideal for use where cooking must be done for a large number of persons, but where steam is not available the year 'round. It will do everything expected of a regular Steam-jacketed Kettle operated on a steam line.

About 60 minutes are required to bring water to boiling point and create steam in the 60-gallon size of this type kettle. Made in seven sizes from 15 to 60 gallons capacity.

"Wear-Ever" regular steam-jacketed kettles which can be operated with steam or electricity are available in sizes from five to 300 gallons capacity.

"WEAR-EVER" ALUMINUM TRAY

After years of scientific research, metallurgists have discovered a formula for an amazing new alloy for trays, combining all of the ideal qualities for cafeteria service. Come in eight sizes—natural or alumilite finish. We invite you to put these new trays to a service test.

"WEAR-EVER" RANGE UTENSILS

The "Wear-Ever" line of heavy-duty aluminum ware includes everything needed in the form of range utensils—sauce pans, sauté pans, stock pots, etc.—all made of thick, sheet aluminum, every utensil stamped from single piece of metal without joints or seams and with extra thickness of metal where needed to resist wear.

For full information regarding these range utensils, see your regular supply house, or write for catalog.

"WEAR-EVER" PITCHERS WITH COOL HANDLES

permit easy and comfortable handling of hot liquids. Of course they are suitable for use with all kinds of liquids. These pitchers are available in capacities from one to five quarts.

There is a comprehensive "Wear-Ever" booklet on heavy-duty aluminum ware. It is FREE. Send for your copy. Address: THE ALUMINUM COOKING UTENSIL COMPANY, 11TH STREET, NEW KENSINGTON, PA.

CORNING GLASS WORKS

PYREX HOUSEWARES DIVISION

Corning, N. Y.

T.M. REG. PYREX U.S. PAT. OFF.

Advantages of Using "PYREX" Brand Dishes In the Foods Laboratory

- Opportunity to teach family meal service in shorter class periods and with less effort.
- Better finished products, since beginners can see food baking.
  Practically no danger of failure by scorching or undercooking.
- Less storage space needed — one "PYREX" dish does the work of both cooking and serving dishes.
- More class time for constructive work—controlled laboratory tests prove that foods bake faster in "PYREX" Ware.
  Use of "PYREX" Ware means fewer dishes to wash with no lowering of good standards.
- Economical investment—saves the money that would otherwise be spent on separate cooking and serving dishes.
- Low initial cost—and a generous replacement policy.

NEW!

MATCHING SET

New Design Casserole — with Custard Cups
"Thin as Table Glass"

WRITE!

FOR CATALOG

Advantages of Using "PYREX" Brand Dishes In Cafeterias and School Dining Rooms

- Refinements in meal service — hotter food and better appearance of food at time of serving.

CORNING *means* Research in Glass

- Food saving — controlled tests prove that more food is eaten, instead of being wasted, when "PYREX" dishes are used.
- Lower breakage costs and a generous replacement policy

AKINS SALES CO., INC.

142 West 14th Street, New York, N. Y.

Quality Products Which Have Stood the Test for Over 45 Years

PRODUCTS

CHANGEABLE LETTER
- **BULLETIN BOARDS**
- **MENU BOARDS**
- **HONOR ROLLS**
- **CLASS SCHEDULES**

CORK BULLETIN BOARDS
DIRECTORY BOARDS
CLUB ROSTERS
GOLD HANDICAP BOARDS
IN AND OUT BOARDS
BRONZE TABLETS
BRONZE LETTERS
FLOOR DIRECTIONAL ARROWS
DESK NAME PLATES

CHANGEABLE LETTER MENU BOARDS

Made in various stock sizes, with wood, bronze, nickel silver or satin finish chrome Kalomein frames or solid bronze frame.

CAST BRONZE TABLET

Cast bronze tablets, plaques, historical markers, fraternity emblems, insignia and bronze letters.

Sketches, suggestions and prices will be sent on request.

CAST INDIVIDUAL BRONZE LETTERS

Made in Various Stock Designs and Sizes

DESK NAME PLATE

Cast bronze plate
Also made with
Wood frame with changeable letters or
Wood block with white embossed lettered card with beveled glass face.

HONOR ROLL BOARD

This honor roll is perpetual, because it uses easily changed letters.

ALL TYPES OF CHANGEABLE LETTERS SUPPLIED. DOUBLE PRONGED BRASS WHITE ENAMELED LETTERS; DOUBLE PRONGED FLAT CELLULOID LETTERS; DOUBLE PRONGED EMBOSSED CELLULOID LETTERS; SINGLE PRONGED COMPOSITION LETTERS; SINGLE PRONGED CAST ALUMINUM LETTERS

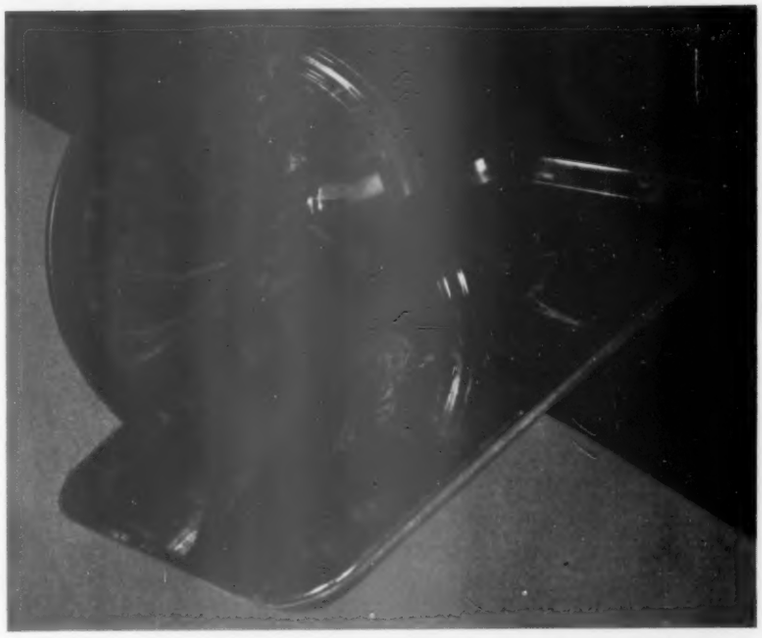
CHELSEA PRODUCTS

281 11th Avenue, New York

CAFATRAYS

Eleven Popular Sizes for *Every School Cafeteria Purpose*

Facts About CAFATRAYS



● **Quiet**—They absorb noise . . . make no harsh clatter in handling, stacking or serving, even when hundreds are being used in the same room.

● **Sanitary**—CAFATRAYS come up rich and lustrous after one dishwashing. They look clean, and what's more, they ARE clean. Their hard, smooth surface cannot absorb grease or food matter. They never stain, even from fruit acids.

● **Tough**—They are practically indestructible. We made them to stand the gaff of modern dishwashing machinery and all the banging around that modern food service gives. Years of service in some of the largest chain cafeterias in the country have proven their stamina.

● **Light**—CAFATRAYS are made as light as it is possible to make a tray and still achieve durability.

● **Beautiful** — Their beautiful butt-grain mahogany color, cast in the body itself, never fades. And there is no surface lacquer or other super-imposed finish to wear away or mar.

Catalogue Number	Size	Weight Packed in Cartons of 1 Doz.	Prices
75	4½" x 6½"	2½ lbs.	$ .37½ (Ctn. of 12, $4.50)
1344	6 " x 8 "	4 lbs.	$ .57 (Ctn. of 12, $6.84)
1345	8½" x 11 "	9 lbs.	$ .79½ (Ctn. of 12, $9.54)
1346	10¾" x 14 "	13 lbs.	$1.05 (Ctn. of 12, $12.60)
1347	12¼" x 16½"	18 lbs.	$1.35 (Ctn. of 12, $16.20)
1348	14 " x 18 "	24 lbs.	$1.57½ (Ctn. of 12, $18.90)
1348½	15¼" x 20½"	34 lbs.	$2.25 (Ctn. of 12, $27.00)
1349	16½" x 22½"	47 lbs.	$2.55 (Ctn. of 12, $30.60)
1111	11" Round	9 lbs.	$ .82½ (Ctn. of 12, $9.90)
1414	14" Round	14 lbs.	$1.27½ (Ctn. of 12, $15.30)
1616	16" Round	20 lbs.	$1.65 (Ctn. of 12, $19.80)

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Princeton, N. J.
Columbia University,
New York City
14 Public School Cafeterias,
Seattle, Wash.
Fordham University,
New York City
Villa Maria Academy,
Malvern, Pa.
Cherry Valley Central School,
Cherry Valley, N. J.
Eastern Texas State Teachers' College,
Commerce, Tex.
Dep't of Hospitals of the City of New York,
New York City
John B. Stetson University,
De Land, Fla.
Mountain Lakes High School,
Mountain Lakes, N. J.
Purdue University,
Lafayette, Ind.
Wyandotte High School,
Kansas City, Mo.
State Hospitals,
State of Missouri
Bureau of Printing and Engraving Cafeteria,
Washington, D. C.

SECTION X
LABORATORY DESIGN AND EQUIPMENT

SPECIAL TYPES OF EQUIPMENT FOR HIGH-SCHOOL SCIENCE LABORATORIES

By RAYMOND V. LONG

Director, Division of School Buildings, State Department of Education, Richmond, Va.

SCHOOL authorities, during the past few years of active school-building programs, have become aware of the fact that the problem of selecting suitable special equipment is approaching in complexity that of deciding upon a proper and suitable educational program. Time was when there were few manufacturers of school equipment, and the types and styles they offered to school authorities were limited and specific. Today one is ofttimes puzzled to determine whether many of the educational periodicals are equipment catalogs or actually educational magazines. The daily mail brings to the desk at least one catalog or descriptive circular, loud in its claims on attention as to the merit of the equipment it describes. The ubiquitous manufacturer's representative presents for consideration a veritable encyclopedia of equipment, along with a sales-talk that leaves the superintendent or other authority responsible for selecting equipment glassy-eyed and bewildered.

In 90 per cent of the high schools only one teacher is employed to teach the sciences, with an assistant in a few cases, and when equipment is to be purchased, his recommendation is usually given serious consideration; but it often happens that such a teacher has a predominating bent for some particular science, or some particular method of teaching science, with the result that special equipment and apparatus are frequently selected in terms of this predominating interest, and then one of two things happens—either the science offering is unbalanced, or, when that particular teacher passes on, the successor finds the highly specialized equipment and apparatus too inflexible to serve satisfactorily his method of teaching, and as a result much of such equipment is unused.

Those who are familar with the complexities of this problem will agree, I think, that some set of rules or standards can be devised that will serve as a guide in the selection of laboratory equipment, and that such standards need not be purely empirical ones, but can be based on definitely established facts.

There is some difference of opinion as to what sciences should be taught in the high school; there is a wide difference of opinion as to how the sciences should be taught; coupled with these two varying conditions is the highly important item of the size of the enrolment. It seems obvious that the following items must be analyzed and conclusions reached on each in the light of such analyses before purchasing or selecting equipment for the laboratory:

First: What sciences are to be taught in the high school?

Second: What is the type of educational program that will use the equipment for teaching sciences?

Third: What is the enrolment of the high school for which science equipment is to be selected?

Science Courses in High Schools

It is safe to say that in terms of present-day practice such sciences as physical geography, zoology, botany, astronomy and physiology do not command a sufficiently important place in the curriculum of any well-organized high-school system to warrant special laboratory facilities. Such of these sciences as are taught are usually presented as a part of general science. The prevailing practice is to offer in the first year of high school general science, in the second year biology, and in the third and fourth years chemistry and physics. Depending upon the enrolment in the high school, there is a wide variation in practice in the science-offering, particularly in the third and fourth years. Usually, general science is required of all first-year high-school students. Frequently in the second year, chemistry and biology are offered in alternate years in the very small high schools. In the third and fourth years in the small high schools chemistry is usually offered, and sometimes chemistry and physics are offered in alternate years. In many cases neither chemistry nor physics is offered in the very small high schools. It is safe to say, however, that in the light of general practice general science is required of all first-year students. Biology is elective in the second year, and chemistry and physics are elective in the third and fourth years.

In addition to these four sciences which are usually

offered in the high school, there are two subjects that may be regarded as sciences, taught in some high-school programs; namely, agriculture and domestic science. Generally, however, such agriculture as is offered as a science could well be offered as a part of general science; and when agriculture is offered as a distinct subject, it is generally regarded as a vocational subject, and so taught. Domestic science is frequently offered in the grammar grades, and also in the high-school grades, as a science, but the tendency is to offer domestic science either as a vocational subject, or as a pre-vocational subject, and not as a science. These two subjects, therefore, are not commonly regarded as high-school sciences, and special laboratory equipment for them is not considered in this paper.

Recommendations for the selection of special equipment for teaching the sciences in the high school will therefore be limited to general science, biology, chemistry and physics.

Types of Programs

The second item, What is the type of program that will use this special equipment for teaching science? is somewhat more difficult to analyze. Common experience would probably divide high-school programs into three general types or groups—the traditional group, the transitional group, and the progressive group. The educational enthusiast might even become insulting to some in classifying these groups somewhat as follows: the first group, the outmoded formalist, who insists on teaching the sciences in the traditional manner prevailing a generation or so ago; the second group, the floundering and bewildered conservatists who are endeavoring to maintain a somewhat middle road between the two extremes; and the third group, the ultra-progressive who has developed a corner on educational procedures and concepts that relatively few are privileged to acquire.

Regardless of classification, we all recognize that in general practice in high-school programs and offerings we have two rather extreme groups, and then the large intermediate or middle group. One extreme is the group that prefers to teach science in a type of recitation in which there are prescribed book experiments, the well-known notebook, and, in general, systematic, orderly, formal laboratory and recitation procedure. The other extreme is the group that has gone far to the left—where the recitation may be characterized as planned disorder, and too often unplanned disorder, where the teacher attempts to play the role of Mark Hopkins, which is highly to be desired, provided we are sure of our Mark Hopkinses, and provided, further, we are sure of our logs. Then there is the large group of high-school educational programs that endeavor to progress, but with eyes straight ahead, near the middle of the road—the group that builds its educational offering around the pupil, but at the same time recognizes that disagreeable doses must occasionally be prescribed.

In the light of present educational trends we could scarcely justify the selection of special laboratory equipment that would wholly satisfy the passé traditional offering, nor can we easily set up a list of recommended types of equipment to satisfy the opposite extremists, owing to lack of definiteness in a program, if for no other reason. Recommendations on special laboratory equipment are therefore limited to the large middle group.

In this group will be found all sorts of complexities due to varying interests on the part of laboratory instructors, and varying ideas as to the type of equipment that can satisfactorily be used for experimental and demonstration work in the sciences. There are science instructors who have predominating specialized interests in electricity, and if the equipment is selected on their recommendation the physics laboratory will carry all manner of electrical equipment, panel boards and electrical gadgets that may be used extensively under that instructor, but will be largely unused with succeeding instructors who lack the same specialized interest; or the particular interest of the instructor may be in medicine, and the biological and chemistry laboratories will be well provided with equipment and apparatus which he would use no doubt to good advantage, but which succeeding instructors would find largely useless.

In selecting equipment, therefore, to accommodate this middle group, extreme care must be exercised to insure flexibility in making its use easily adaptable to different instructors with varying specialized interests. Incidentally, the administrator of a school system should select instructors who are susceptible to flexibility, and can adapt themselves to using the equipment provided.

Another feature of the high-school program that demands flexibility in the selection of equipment is the continuously changing character of subject matter in the sciences, and equipment should be selected that will permit a changing usage. The variety of use of the room in which the equipment is to be placed should also be observed in the selection of equipment. This may make desirable a type of equipment that can be easily moved. Such selection would be possible in the general science and biology laboratories, but would not be practicable in the physics or chemistry laboratory.

The following recommended selection of equipment, therefore, for the high-school sciences is set up to accommodate the high-school educational program of the middle group, along with such flexible features as can be combined in the selection of such equipment.

The High-School Enrolment

An analysis of the third item—the high-school enrolment—is largely a matter of mathematical calculations. The Biennial Survey of the United States Office of Education, not yet published, reveals that the distribution of regular public high schools, according to enrolment for the session 1933-34, is as follows:

Enrolment	Number of High Schools in the United States	Percentage
10–24	1,446	8.75
25–49	2,937	17.7
50–74	2,980	18.
75–99	2,320	14.
100–199	3,915	23.6
200–299	1,118	6.75
300–499	772	4.67
500–999	533	3.23
1,000–2,499	382	2.3
2,500–and over	171	1
	16,574	

It will be noted from the above data that 82 per cent of the high schools have enrolments of less than 200, and 58.5 per cent have enrolments of less than 100. The majority of high schools, therefore, are concerned with laboratory equipment for enrolments of less than 100, and 82 per cent of them are concerned with equipment for enrolments of less than 200.

Distribution of students by grades in the regular four-year public high schools is: 1st year, 40 per cent; 2d year, 27 per cent; 3d year, 20 per cent; 4th year, 13 per cent. Dr. Monahan finds that science classes are distributed according to the following table:

DISTRIBUTION IN SCIENCE CLASSES

	Enrolment	No. in Science	Enrolment	No. in Science	Enrolment	No. in Science
Total	100	50–100	200	100–200	500	250–500
1st yr.	40	20–40	80	40–80	200	100–200
2nd yr.	27	14–27	54	27–54	135	68–135
3rd yr.	20	10–20	40	20–40	100	50–100
4th yr.	13	7–13	26	13–26	65	33–65

The number of those who take science in the high school varies with local conditions, but it is safe to accept as the general prevailing practice that 50 to 60 per cent of the total high-school enrolment will take science. Recent studies indicate that about 52 per cent of the high-school enrolment are taking high-school science. The general practice is to require all first-year students to take general science, leaving biology elective in the second year, and chemistry and physics elective in the third and fourth years. In many cases physics and chemistry are offered in alternate years, and in many other cases in the smaller high schools chemistry only is offered as an elective for the third and fourth years.

Enrolment to Be Accommodated by Science Equipment

In the light of the foregoing it appears that from the analyses made of the third item—what enrolment the equipment is to accommodate—we can safely deduce a formula that will determine the number of science sections that must be served, and the number of laboratories that must be provided. These analyses also point the way to the kind of laboratory layout and type of equipment best adaptable to the different sizes of high schools.

The following table contemplates that four sciences will be offered, with general science required in the first year, and with biology, chemistry and physics elective in the second, third and fourth years. It also assumes that 60 per cent of the second-, third- and fourth-year students will elect science, and that the laboratory is designed to accommodate a maximum of 28 to 30.

This table cannot be accepted as an inflexible formula or standard, particularly above the 500 enrolment group, nor does it appear desirable that any inflexible standard be attempted. There are too many local variable conditions, and too many experiments are being attempted in educational programs to warrant universal standards in laboratory requirements, particularly in the larger enrolment groups. In the smaller enrolment groups, below 500, however, which covers 93.5 per cent of all the regular four-year high schools, it is felt that the above table will serve as a safe guide.

No attempt is made to set up recommendations for supplies or for movable and variable apparatus; this paper is concerned only with the special types of equipment and apparatus that are more or less fixed and permanent laboratory equipment.

Laboratory Layouts

For the 100 or less enrolment group of high schools, representing 58.5 per cent of all the regular four-year high schools, the arrangement and layout for one laboratory as shown in attached plate 1A or 1B is recommended. Common sense will, of course, dictate variations from this plan in the high schools with enrolments of 30, 40 and 50 students; as, for instance, in a 50-student school there will be not more than 20 in the first year taking general science, hence, when equipment is purchased the size of sections or classes to be accommodated should be kept in mind. The school of less than 100 should purchase six to ten two-student fixed tables, or four to six four-student fixed tables for the laboratory, as described in plate 1A or 1B. The enrolment groups between 100 and 175 will probably need an adjoining general purpose room, which should be equipped with four to eight two-student tables, or one to four four-student tables, as

RECOMMENDED DISTRIBUTION OF SCIENCE SECTIONS AND LABORATORY ROOM REQUIREMENTS BASED ON ENROLMENT MEASURED IN TERMS OF GENERAL PRACTICE

Enrolment	No. of Sections General Science	No. of Sections Biology	No. of Sections Physics and Chemistry	Minimum No. of Laboratories Required	Adjoining General Purpose Rooms Recommended in Addition to Minimum Laboratory Required	Adjoining General Purpose Laboratories Required	Total Minimum Laboratory Rooms Required
100	2	1	1	1			1L
175	2	1	2	1	1		1L
200	3	1	2	1		1	1L–1GPL
250	4	2	2	1		1	1L–1GPL
300	4	2	2	1		1	1L–1GPL
350	5	2	3	1	1	1	1L–1GPL
400	6	2	3	1	1	1	1L–1GPL
500	7	3	4	2	1	1	2L–1GPL
600	8	4	4	2	1	1	2L–2GPL
700	10	4	5	2	1	2	2L–2GPL
800	11	5	6	3	1	2	3L–2GPL
900	12	5	6	3	1	2	3L–2GPL
1,000	13	6	7	3	1	2	3L–2GPL

described in plate 2A or 2B for the general purpose room. The tables recommended for the general purpose room are of the movable commercial type, with heavy top, acid-treated, with or without drawers, preferably without.

The laboratory for 100 students or less need not be provided with a storage room, but this is highly desirable. Ample storage can be found in the wall cases, but where a laboratory is to be used for such a variety of purposes as in the smaller high school, these cases will be found necessary for storage purposes.

Where the enrolment can safely be predicted not to exceed 50 or 60, the room size can safely be cut to 22 feet wide by 28 feet long, and the equipment purchased accordingly. In view of the rapid changes taking place in our social order, however, it is likely that during the next decade the number of very small high schools will be greatly reduced.

The equipment for a laboratory in the 100 enrolment and smaller group must be of the type that will permit the greatest flexibility possible, and must serve adequately for teaching all four of the sciences. In most schools this equipment should serve for recitation purposes in other subjects as well.

There should be a well-equipped instructor's or demonstration table, provided with running water, sink, gas, 110-volt a-c current and low-voltage d-c current. Adjacent to the instructor's table there should be an aquarium. All available space on the front wall should be provided with blackboard. The fixed type of blackboard will serve, but it is preferable to have either the sliding blackboard or the book-type. There should be a curtain or screen on a substantial roller to accommodate a projector and a 16-millimeter motion-picture machine. The room should be wired and equipped for sound-on-film pictures. Near the front of the room there should be a bulletin-board space not less than 5 feet long by 4 feet high. There should be five commercial type wall cases and a commercial type display case. Along the entire window side of the room there should be a wall shelf 32 inches high, of the commercial type, substantially built and well secured in place. If direct radiators are used, the shelf should not be immediately over radiators.

It is recommended that the multi-service or Lincoln type table be used. This can be purchased for approximately $160 to accommodate two pupils. The four-pupil table, as shown in plate 1B, can be purchased at about half this per-pupil cost, but it is neither so satisfactory nor so adaptable for general purposes and for laboratory purposes as the Lincoln type table. The added advantage of the Lincoln type table is that it is 33 inches high, and by using the special Lincoln type chair these tables will serve satisfactorily for all science work, as well as for recitation work in other high-school subjects.

The rear of the room should be wired to accommodate a projection machine and the 16-millimeter sound-on-film moving-picture machine.

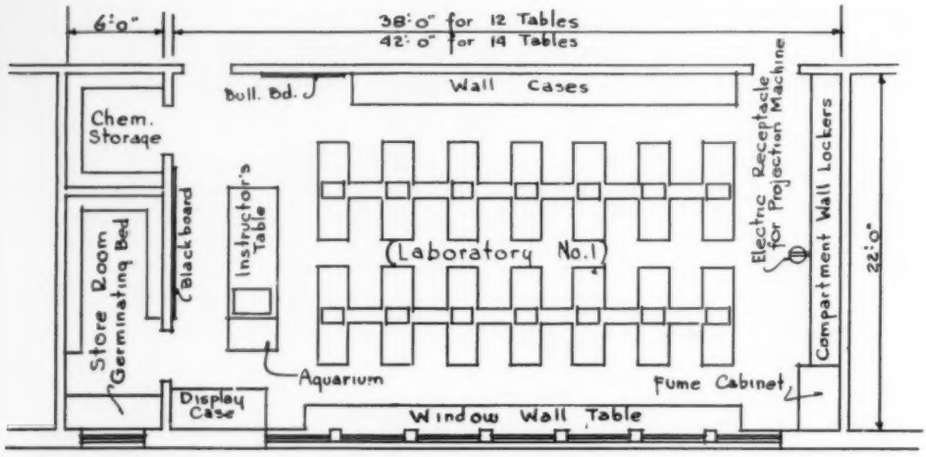

Plate I-A—Recommended laboratory layout and equipment for enrolments up to 175

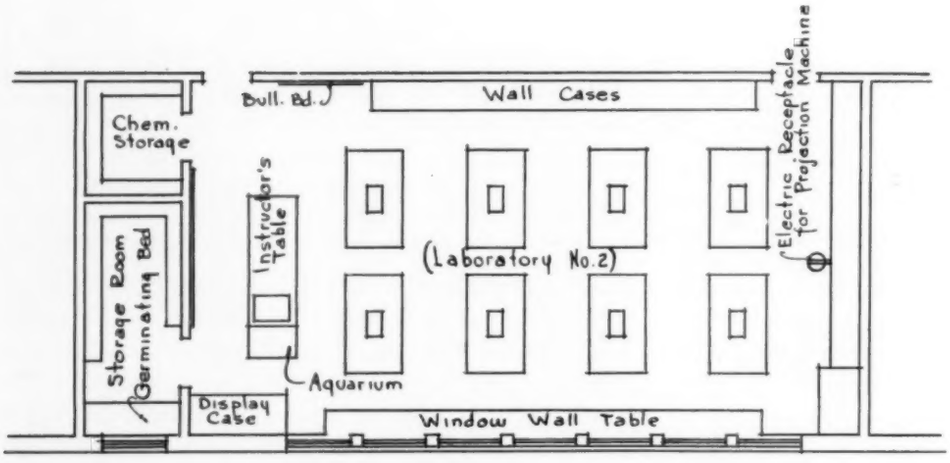

Plate I-B—Alternative laboratory arrangement which will meet needs of enrolments up to 175

It will be highly desirable in many cases to have five tiers of individual lockers, which can be located in the rear of the rooms, as illustrated in plate 1A. This, however, is optional, and must be determined in terms of local conditions.

The necessity for a fume hood is a mooted question. It is recommended that provision be made for a fume hood in all chemistry laboratories where the enrolment is 100 or over.

There should be provision for chemical storage separate from other storage space, such chemical storage to be ventilated with a masonry-lined duct; also for space, as shown in plate 1A, for general storage purposes for all the sciences that are to be taught; also for a germinating bed, desirably located beneath the window in the storage room.

It will be noted that plate 1B is identical with 1A in all arrangements except that plate 1B suggests the four-pupil type table which may be used as an alternative to the preferred Lincoln table as recommended in plate 1A.

General Purpose Rooms and Laboratories

The 175- to 200-student enrolment group of schools will require essentially the same laboratory provision described above, and in addition an adjoining general purpose room, as shown on attached plate 2A. The general purpose room is so called because it should be an adjunct to the laboratory, and should also adequately accommodate high-school recitations other than science. It should be equipped to act as overflow for general science and biology, and flexible enough to serve other school purposes.

The general purpose room should have an instructor's table, wired for 110-volt a-c current and low-voltage d-c current, water and gas; and should be equipped like the laboratory, with blackboard, projection machine, screen and 16-millimeter motion-picture machine. The table equipment should consist of two pupil tables, as shown in plate 2A, in either arrangement as shown in 2A, depending on the size of the sections to be served.

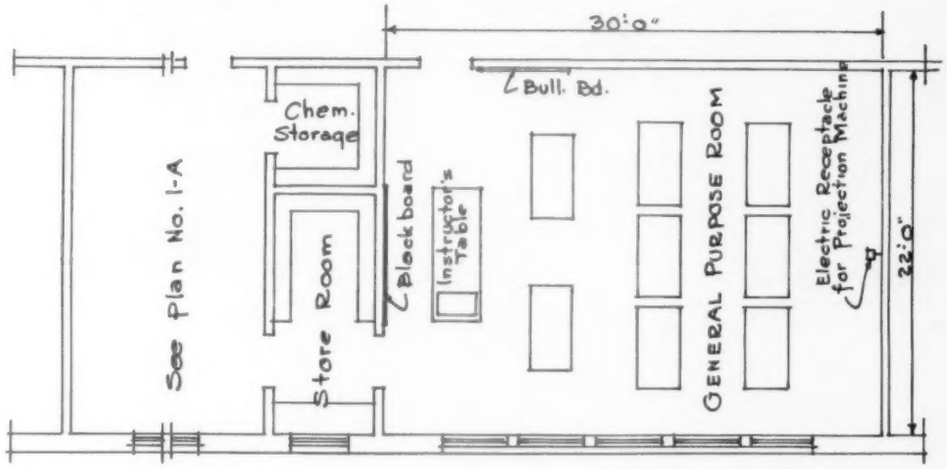

Plate 2-A—A general purpose room will meet varied needs of enrolment groups from 175 to 500

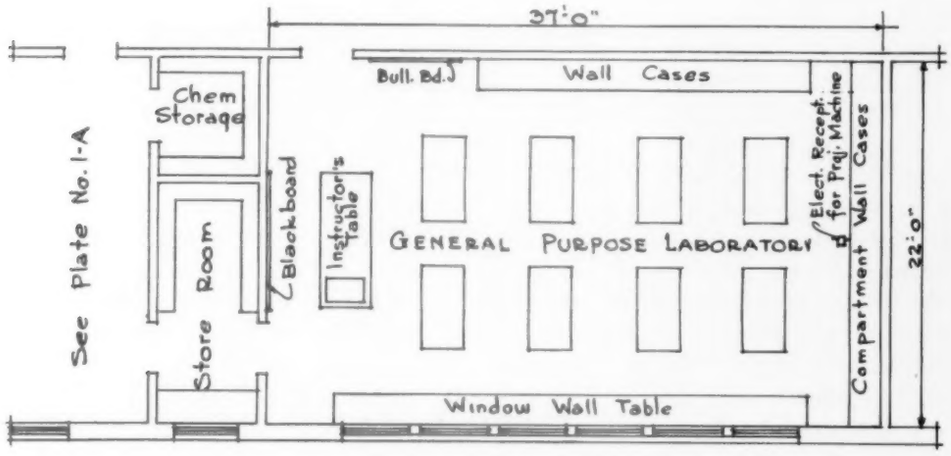

Plate 2-B—A general purpose laboratory to supplement the regular laboratory as enrolment passes the 200 mark

The enrolment group from 200 to 300 can well be served with one well-equipped laboratory, and one general purpose laboratory. The laboratory should be similar to the laboratory described in plate 1A. The general purpose laboratory will be similar to the general purpose room described in plate 2A, but additional storage facilities will be necessary, since this general purpose laboratory must serve more largely as a laboratory than the general purpose room. In addition to the movable tables and instructor's table, projection machine, etc., described for the general purpose room in plate 2A, the general purpose laboratory as shown in plate 2B should be provided with a window shelf, and with wall cases, the number of wall cases to be determined by the number of students to be served. Individual locker space will be desirable in many schools, and such locker space should be provided as called for in laboratory plate 1A.

The enrolment group from 300 to 500 will require a laboratory as described in plate 1A, one general purpose laboratory as described in plate 2B, and one general purpose room as described in plate 2A.

Special Laboratory Equipment

The enrolment group of 500 and up can justify special equipment for the different sciences. However, for the 500 to 700 enrolment groups, it is doubtful if we can justify special equipment for more than two laboratories, one for chemistry and one for biology. Plate 3A describes such an arrangement, with an additional general purpose laboratory and a general purpose room, all of which will be needed to serve adequately the four sciences in enrolment groups from 500 to 700. The biology laboratory as shown on plate 3A contemplates a plain table similar to the design of the table for the general purpose laboratory.

Enrolments of 500 and up will in general demand special study in terms of special local conditions. We may say that very few high schools need or can justify more than one special laboratory for each science. Certainly in the group below the group of 700 enrolment we cannot justify special equipment for

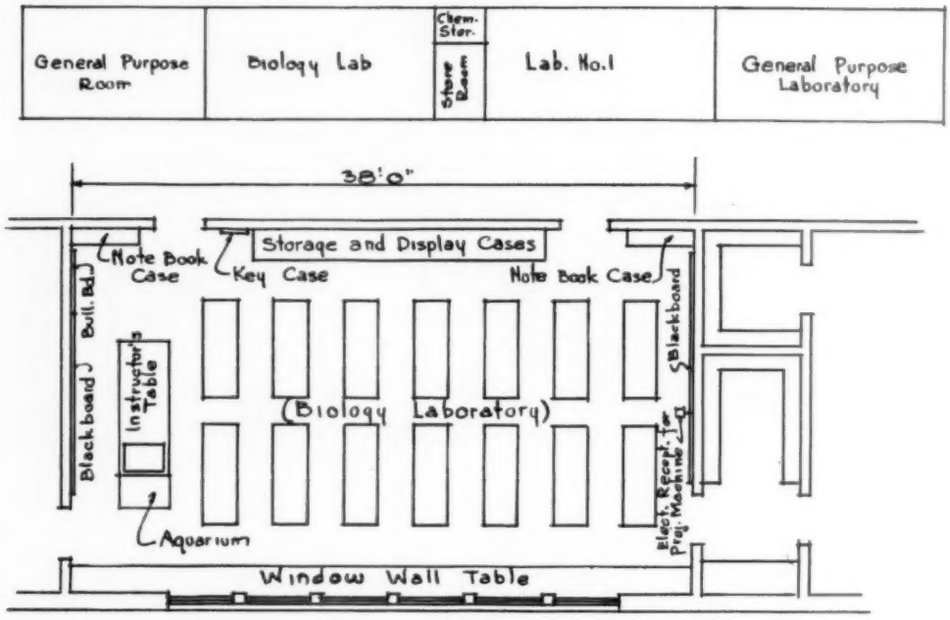

Plate 3-A—Recommended lay-out and equipment for enrolment groups of 500 and over

more than one special laboratory, and even in that case the equipment should be as flexible in type as possible. Beyond the 700 enrolment, which would cover relatively few high schools in comparison with the total high schools in the country, we can justify selecting special chemistry equipment, special physics equipment, special biology equipment, and special general science equipment.

Considerable has been written explaining how laboratory equipment can be manufactured locally. There are perhaps cases when this is essential in order to provide any kind of reasonably adequate or satisfactory equipment. It is probable, however, that there are few cases where a good grade of commercial equipment cannot be purchased if the purchasing authority fully understands all the facts in the case. When laboratory equipment is manufactured locally, it usually develops that the equipment is not comparable in quality, durability or service to a good grade of commercial equipment made by a reputable manufacturer, and the cost of local equipment is seldom less than 50 to 75 per cent the cost of a good grade of commercial equipment. Generally speaking, the manufacture of equipment locally, or by concerns not long experienced in manufacturing laboratory equipment, should be discouraged.

The above recommendations are presented with no thought in mind that they represent an ideal or a standard that can or should be accepted in full, or by all communities. The recommendations have been presented from the point of view of a school architect confronted with the lack of definiteness in educational programs as to the desirable room sizes and laboratory layouts in new school buildings. When the architect is commissioned to prepare plans for a high-school building, he is very limited in instructions for laboratory provisions, and such instructions as are given are without definite assurance based on fact and experience.

It is felt that the above recommended standards are sufficiently flexible to permit a changing educational program without involving expensive wastage in special types of equipment, and that at the same time the standards will provide reasonably adequate facilities for the high-school sciences. It is altogether probable that further study will dictate revisions of the standards recommended above, but these standards will in the meantime, we believe, serve as a satisfactory basis on which to plan and equip high-school laboratories.

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PLANNING AND EQUIPPING LABORATORIES FOR RESEARCH

Recent Experience at Mellon Institute

By HARRY S. COLEMAN

Assistant Director, Mellon Institute, Pittsburgh, Pa.

IN THIS article the intention is to present a condensed but useful account of the conclusions formed in Mellon Institute after thorough study of research laboratory construction problems, in the light of the Institute's quarter-century of scientific investigation of broad scope, supplemented by observations in many other laboratories. The narrative has been written upon invitation consequent upon the recent dedication of the new home of the institution, in which these ideas of laboratory design are embodied. First, however, so as to give a clear background of the Institute's laboratory requirements, there will be set forth a short description of the organization's purpose, history, and research procedure. It is hoped that the whole contribution will be interesting and informative to specialists who are concerned in science education, laboratory layout and equipment, and laboratory maintenance or management.

Mellon Institute is a research institution to which problems of science and industry are submitted for solution. It has three major functions. It is a station for investigation in pure and applied science. It is a school for training research workers through practical experience in investigational methods. It is a clearing-house of technical information for the professions and public.

The Institute's Fellowship System is the outgrowth of an idea conceived by Robert Kennedy Duncan, who had noted the harmonious cooperation of science and industry in Europe and became convinced that such a plan would react to the benefit of technology in this country. This concept was first put to actual test in the University of Kansas in 1907, where Duncan was teaching at the time. Through a book describing this plan, the interest of Andrew W. Mellon and Richard B. Mellon was aroused, and Duncan was invited to introduce his system at the University of Pittsburgh, which he did in 1911. It soon became evident that the procedure was sound, and Mellon Institute was founded in 1913 and the Fellowship System established on a permanent basis. In 1915 the Institute moved from its original small frame laboratory into the building which it occupied until the completion of its new headquarters, dedicated on May 6, 1937.

Operation of the Institute's Fellowships

Under the Fellowship System as applied in industry, research problems are proposed by firms or associations to which their solutions will be beneficial. If a given problem is of such scope as to be acceptable to the Institute, the investigation is organized under a contract with the donor for a period of at least one year.

The scientific worker, with training and experience that fit him for that particular research, is found and engaged by the Institute. He is accorded use of laboratories and facilities, guidance and advice of the Institute's executive staff, and cooperative aid of other Fellows. Only one research is conducted on a specific subject at any one time.

At present sixty-eight Industrial Fellowships are in operation, each requiring the full-time services of from one to nineteen scientists. Altogether, two hundred and five specialists are engaged in this work.

The Institute's New Building

The Institute's new home is a structure of limestone, containing 6½ million cubic feet. In the treatment of the architecture, inspiration was drawn from the finest examples of classic Greek works, and some of their best features are represented in the Institute building. A colonnade of 62 monolithic columns surrounds the building. Each column is 36½ feet long and nearly 6 feet in diameter and weighs 60 tons. The columns rest on turned stone bases and are surmounted by carved Ionic capitals. The building contains eight working floors and an attic. More than two floors are completely below ground, the main entrance being on the fourth floor, with a side entrance and truck entrance on the third floor. Nevertheless, all floors are adequately lighted because of the use of light courts which extend down to the first floor level.

The outside of the building is in the form of a hol-

low square, with center and connecting wings in the form of a cross. It is approximately 306 feet wide at the front, 227 feet wide at the rear, and 334 feet from front to rear. Like the outside sections of the building, the center wing, running from front to rear, is nine stories high. The cross-wings are four floors high. There are 1,151 windows in the court walls.

The main or fourth floor is occupied by the executive offices, general office, and library. The three lower floors contain the various general service departments, the auditorium, and the sections for large-scale experimentation. The fifth to eighth floors, inclusive, are given over to research laboratories, while the ninth floor or attic houses much of the ventilating apparatus.

Models Used in Planning

Models were used extensively during the planning of the building, both for the exterior and the interior. For the exterior three models were made as the design progressed: one of the complete building to a scale of $\frac{5}{32}$-inch to 1 foot; later, one of the front façade to a scale of $\frac{3}{4}$-inch to 1 foot; and, finally, a full-size model of a corner of the building, including two columns, cornice, attic wall, etc. Likewise for the interior, a frame building was built in which was constructed and completely equipped one each of the two types of standard laboratories. The design of these rooms was thought to be well worked out on paper, but by the use of the model laboratories it was possible to make many changes in the way of improvements and simplification. Also, by the use of the model, helpful criticism was received from many persons who could not or would not study a drawing. As a result of this careful consideration, there are many innovations in these laboratories and their equipment which have been found to be of great practical value in use.

The Research Laboratories

The research laboratories at the Institute are of two sizes, typical plans of which are shown in Figure 1. Each small or two-window laboratory occupies a bay of the building and includes two laboratory benches along the side walls. The right-hand bench is shortened at the window end to make room for the special laboratory desk to be described later. A built-in clothes locker is included.

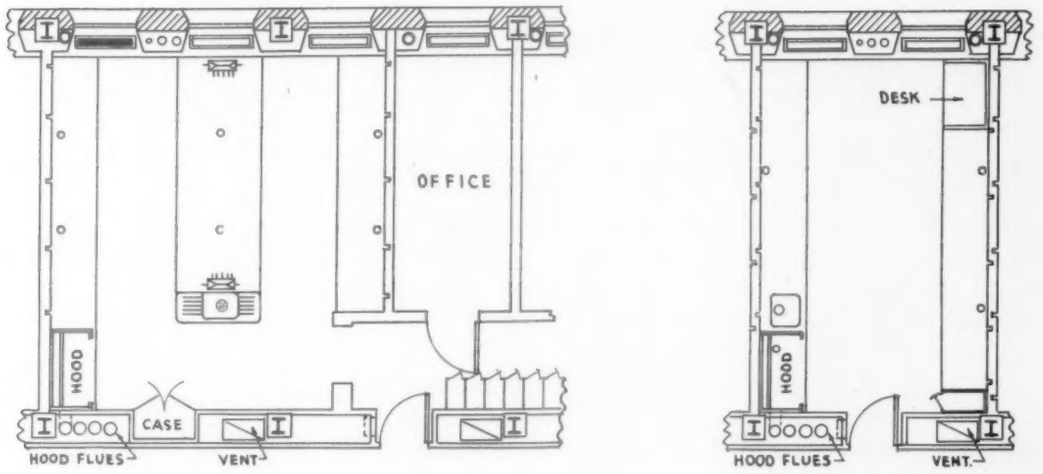
Each large laboratory with its adjoining office (three windows in the laboratory and one in the office) occupies two bays of the building. The laboratory furniture in such a laboratory consists of a wall bench along each partition wall, and a center type bench connected to the window wall, with a large sink on the opposite end. The large laboratories are in general located in pairs—one right- and one left-hand—with a common entry. If it is desired to separate the two rooms, the entryway is divided by a bank of clothes lockers placed across it. If the two rooms are to be connecting, the lockers are placed against the corridor wall, leaving a passageway from one room to the other. Recesses are provided in the terra cotta walls of the entry to receive the knobs of the office doors, so that as much space as possible will be had when the rooms are used en suite. Recessed cases are set in the corridor walls of the large laboratories in the area which would have been used as an entrance door if the two bays of the building had been utilized for two small laboratories instead of one large laboratory.

The small laboratories vary in width from 11 feet, 9 inches to 12 feet, $2\frac{1}{4}$ inches, and the large laboratories from 17 feet, $3\frac{1}{4}$ inches to 17 feet, $11\frac{1}{2}$ inches. The depth of both types is the same and varies in different wings of the building from 18 feet, 10 inches to 19 feet, 2 inches.

Constructional Materials Used

Throughout the laboratory floors and on most other floors of the building, glazed architectural terra cotta blocks are used for corridor and room walls (with the exception of the window ends of the laboratories, as will be explained later). These blocks are of cream or light buff color, 16 inches by 8 inches in size, and laid with a thin tinted mortar joint. In most cases the blocks are 3 inches thick, glazed on one surface only. Partition walls which are finished on both sides are therefore about $6\frac{1}{2}$ inches thick. Terra cotta walls are particularly appropriate for use in laboratories because of their ease of cleaning and freedom from attack by ordinary laboratory fumes. Ready cleanability is facilitated by the use of round corners, both internal and external, and by a cove-base course (of a chocolate-brown color here). When a glazed wall is used, it is important that the blocks be of large size so that the percentage of area devoted to mortar joints will be a minimum. Special shapes in terra cotta may be had at reasonable extra cost, and their use where odd angles occur prevents unsightly continuous vertical mortar joints. Also, as in the case of door-knobs mentioned above, objectives can be attained which are difficult with many other constructional materials. Recesses are provided in the terra cotta corridor walls for fire extinguishers, and first aid cabinets are set flush in the walls.

The window ends of the laboratories are constructed of removable cement-asbestos board panels finished with "Vinylite" paint to match the terra cotta and trimmed with aluminum molding strips. These panels conceal all service distributing pipes and drains, yet



Large laboratory

Small laboratory

Fig. 1—Floor plans of typical research laboratories

render them readily accessible for repairs. Openings left in the floor slabs between the windows back of these panels make it possible to bring down from the attic any type of service pipe which may be required. This feature is one that contributes to the great flexibility of the Institute's laboratory layout.

The choice of a laboratory flooring material has always been a most difficult problem in laboratory design. Asphalt tile or mastic has been commonly used for a number of years. While such a flooring is resistant to acids and alkalies, it softens readily if subjected to solvents and usually indents badly under concentrated loads. After considerable study, vitrified, impervious ceramic tile was selected for Mellon Institute. The blocks are 6 inches square, of a buff color, and are laid with a narrow mortar joint using high silica cement, which is more resistant to acids than ordinary portland cement. If the joint should be attacked, it can, of course, be regrouted. Some may feel that this floor is too hard where the technician is required to stand for long periods. The writer believes that the difference in resiliency of any of the floors suitable for laboratory use is slight. Cork and rubber are the only truly resilient floors, and neither is suitable for general laboratory use. Loose resilient mats may, of course, be provided in the laboratory where required.

The laboratory ceilings are plaster, painted with "Vinylite" paint. Diamond metal mesh was first securely anchored to the tile slab and then scratch and brown coats of mortar composed of neat gypsum wall plaster were applied. The finish or skim coat was composed of properly soaked hydrated lime and pure white gypsum gaging plaster. This type of ceiling finish was selected after extensive tests had been made with all types of plaster. It was found that, with the use of the metal mesh, common patent or gypsum plaster could be used with less likelihood of the plaster falling than with any of the more expensive cement plasters. Furthermore, gypsum plaster does not craze and crack as does cement plaster.

Arrangement of Ventilating Ducts and Service Mains

The ventilation ducts are in the thick walls between the laboratories and corridors. Slots were left in the floor slabs at these points so that the ducts could be readily installed. Inasmuch as the two faces of the thick wall are terra cotta, it was imperative that materials used for ducts and flues be of the most lasting type. For the ducts supplying the laboratories with washed and filtered air, "Armco" iron, painted inside and out with asphaltum paint, was employed.

For the fume-hood flues 8-inch chemical stoneware was used. These flues project about 1½ inches into the laboratories and connect directly with the plenum chamber of the hoods to be described.

Because of lack of space for joints of the bell-and-spigot type, the ends of the pipe were ground square, and the joint was made by bolting around the pipe a metal band 2½ inches wide and ¼-inch thick after the ends of the pipe had been seated in mastic.

Also in this thick wall are horizontal electric conduits feeding the laboratory panel boxes at each laboratory entrance door. Above each entrance door is a pull-box for making the connection from the feeder to the laboratory panel-box.

Under each window stool, which is at laboratory bench height and made of the same material as the bench top, is a cast-iron convector-type radiator. The outlet grille in the stool is V-shape so that the heat cannot be closed off by piling articles on the stool. The steam heat is controlled by dual thermostats.

Fume Hoods

A great deal of attention was given to fume hoods in planning the Institute's new building; and several sample hoods were built and tested before a design was decided upon. The hoods are of the open-front type, 54 inches long, 30 inches deep, with a clear opening in front 33 inches high. The inside height is 60 inches and, as indicated, the standard bench top forms the floor of the hood. The hoods are constructed of cement-asbestos board, the inner part impregnated and the exterior finished with "Vinylite" paint to match the terra cotta. A cross-section of the hoods is shown in Figure 2. The Institute hoods have an arrangement of controls whereby all the draft can be applied at the hood top for light gases, or at the bottom for heavy fumes, or the draft can be divided between the top and bottom in any ratio found desirable, or the draft may be closed off entirely. This action is accomplished by slide valves in the plenum chamber at the top of the hood, the operating mechanism consisting of a lever on the end of the hood. The reader will notice in the sketch the auxiliary slot about 12 inches from the bottom. It was found in the tests that this slot contributed considerably to the successful operation of the hood. Most gases are evolved a distance above the floor of the hood, and the pull from this slot prevents these fumes from straying out of the hood. This auxiliary slot is adjustable by raising or lowering the panel beneath by means of eccentrics. In the end of the plenum chamber opposite the flue is a capped opening to which a canopy may be installed over apparatus on the bench top from which it is desired to carry off the fumes. The hood dampers should be completely closed at such a time, of course. The hood is trimmed with aluminum strips similar to those used on the removable panels on the window end of the laboratory. The services for the hood are all on the end opposite the flue and consist of cold water, air, gas, vacuum, and the alternating currents. All services are controlled by cocks or switches outside the hood. Switches are also provided for the light in the hood and for the fan motor in the attic. There is a fan

Fig. 2 (right)—A cross-sectional view of a fume hood

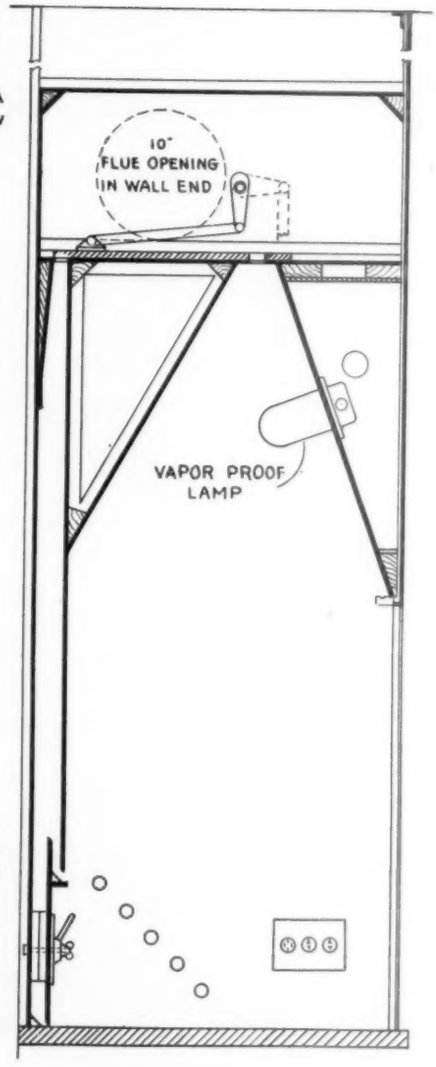
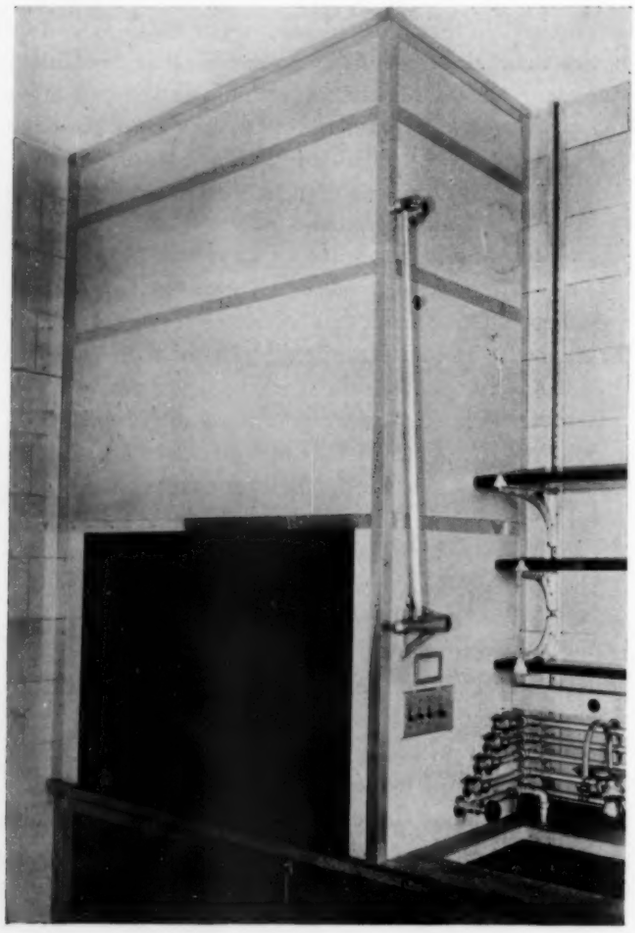


Fig. 3 (left)—Outside view of a fume hood



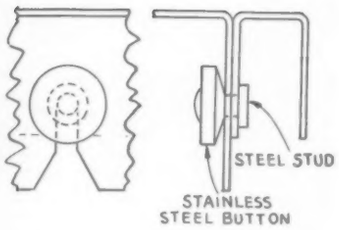


Fig. 4—Detail of lugs used on laboratory bench steel framing

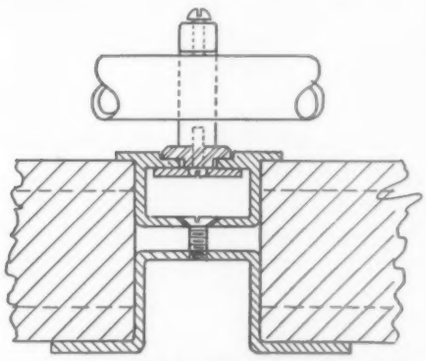


Fig. 5—Detail of vertical T-slot and pipe hanger attached thereto

pilot light on the end of the hood and in the pull-box over the entrance in the corridor. It is the watchman's first duty at night to turn off any hoods which have been left on (as indicated by the pilot light in the corridor), unless a note has been left in the label holder on the hood that the fan was intentionally left on. As a general thing, each fan supplies draft for four hoods—one on each of the four laboratory floors —but the fan will continue to run as long as any switch is in the "on" position. Each hood has an individual flue to the attic, where it is connected to a manifold and thence to the fan.

Vertical Wall T-Slots

Among new ideas are the vertical T-slots running from floor to ceiling in the walls of the laboratories. Figure 5 is a section through the wall showing how the T-slots were installed. The distance between the T-slots is on the average about 33 inches. The T-slot itself is an anodic finished extruded aluminum section. The steel wall stiffener to which it is attached by machine screws also extends from floor to ceiling.

These T-slots serve many purposes and add a great deal to the flexibility of the laboratories. By the use of special aluminum brackets they are employed to support shelving. The distance between shelves may be varied at will; additional shelves may be installed or the shelves may be easily removed to provide wall space for instruments or for bulky apparatus on the bench tops, such as large ovens or conditioning cabinets. The T-slot is also used to support the wiring trough, the service pipes both above and below the bench top, and the drain pipe. In actual practice they have also been used for attaching pencil sharpeners, can openers, etc. With these slots available, there should never be any necessity for drilling the terra cotta for attaching equipment of any kind. Figure 6 is a vertical section through the wall showing how the T-slot is used.

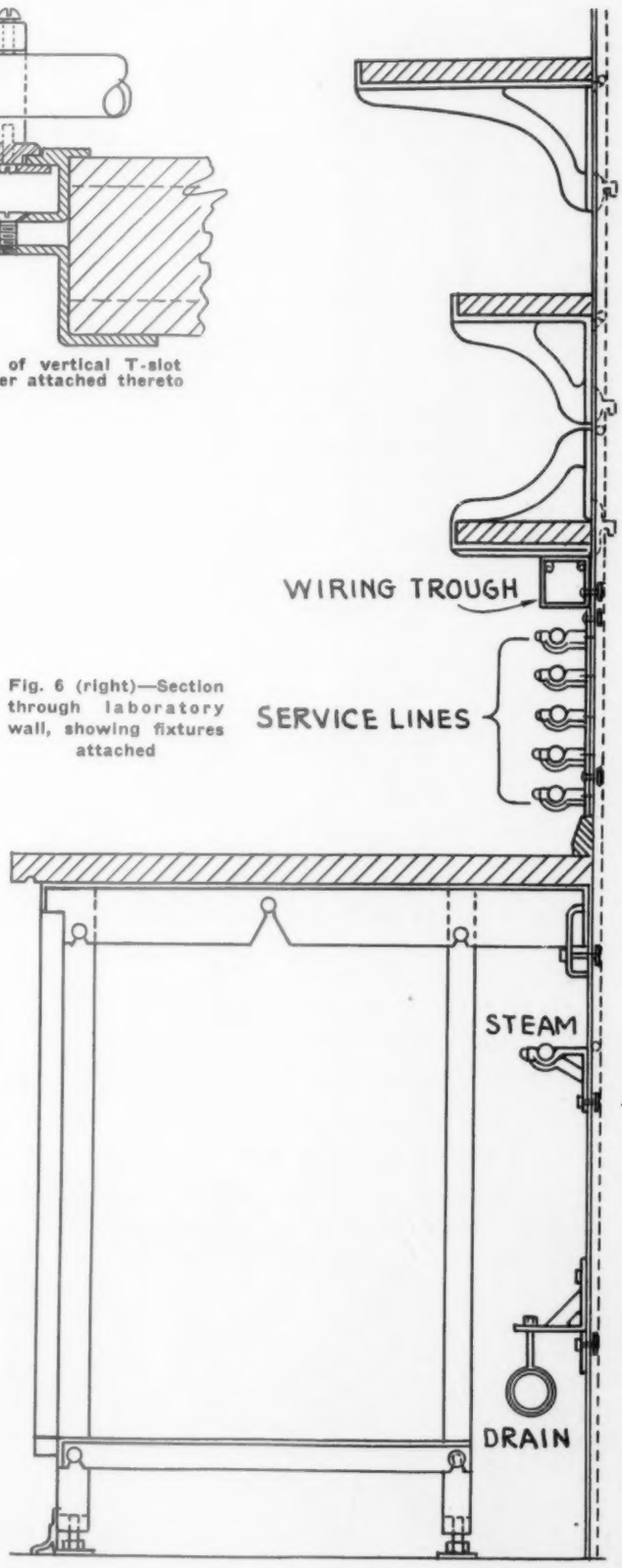


Fig. 6 (right)—Section through laboratory wall, showing fixtures attached

Features of Laboratory Equipment

Because of the varying requirements of the investigations carried on at the Institute, extreme flexibility of the laboratory equipment is of prime importance. Researches in the fields of ceramics, metallurgy, organic chemistry, physical chemistry, biochemistry, etc., require different types of storage cabinets and

other laboratory facilities. A laboratory may be used for one type of work at one time and for an entirely different type a short while later. It may even be necessary to remove an entire laboratory bench to make room for large apparatus.

As a first step in accomplishing this flexibility, the laboratory storage cabinets were made of uniform size throughout the building. They slide in under the bench tops and are held in place by small clips and acorn nuts. As a further step, the steel structure supporting the bench tops and forming the openings into which the storage cupboards fit was designed to go firmly together without the use of bolts or nuts. The bench-top slabs are joined without splines directly over each upright member, so that any section, either end or intermediate, may be quickly removed. The adjustable shelf brackets engaging the T-slots provide the necessary flexibility of shelving. The fume hood may also be readily removed from any laboratory if not required, for it merely rests on a standard bench top. The following description of the laboratory equipment will make clear just how these results were attained.

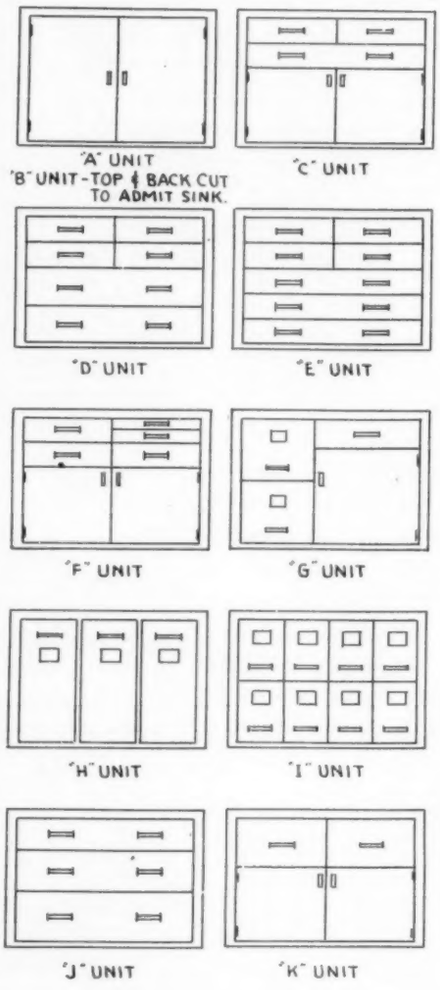


Fig. 7—Removable storage cabinets for laboratory benches

Laboratory Bench Steel Framing

The framework of the laboratory benches is composed of vertical sections and bottom and top horizontal frames. The vertical sections are provided with lugs or buttons (as shown in Fig. 4) which engage suitable slots in the horizontal frames. Vertical sections and bottom horizontal frames are identical for both wall and center type benches. For the wall bench the top horizontal frame is of such a width that a 6-inch pipe space is left between the wall and the back of the vertical sections. This frame is clamped to the wall T-slots. The top horizontal frame for the center type bench similarly provides a pipe space between the vertical sections supporting the frame. The standard spacing of vertical sections is 40¾ inches. The storage cabinet rests on the bottom frame and the bench-top slab on the top frame. The space between the bottom frame and the floor is set back for toe room, and the cove mold and steel sheet closing this space are attached to the uprights by clips instead of bolts. Finished end panels, where required, are fixed to the lugs on the uprights. The four legs of each vertical section have leveling screws. Lugs are placed also on the back of each vertical section for sway braces, or, in the case of center benches, for hangers for service pipes and drain. Lead-coated, copper-bearing steel is used for all the laboratory bench framing. The exposed parts are finished with baked acid-resisting aluminum paint, and the concealed parts with acid-resisting green paint.

Storage Cabinets

The storage cabinets are constructed entirely of wood, except for the formed steel angle which surrounds the face of each unit. This steel angle is finished to match the exposed parts of the steel framing. The cabinets have flush fronts with concealed horizontal dividing rails and are made to such accuracy that any drawer of a given size will fit into the corresponding opening in any cabinet. The front of the cabinet is made of 1-inch thick plywood, 7-ply, with a face of comb-grained Appalachian white oak. The cupboard doors, instead of having solid wood cores, have cores composed of cells about 1½ inches square, which makes for lightness and also decreases the tendency to warp and twist. The ends, back, top, and bottom of the cabinets are of plywood panel construction. Drawer pulls and cupboard knobs are made of a black synthetic resin in a pleasing design. It is believed that this molded hardware will prove superior to metal because of freedom from discoloration by laboratory fumes. Eleven types of storage cabinets, which consist of various combinations of cupboards, drawers, and bins, are available. The front elevation of these units is shown in Figure 7. In addition, the smaller flat drawers are replaceable in any unit by a drawer divided into compartments for corks, etc., or by two shallow drawers for storage of pipettes, thermometers, etc. As mentioned, all storage cabinets are of uniform size. Special tongs gripping suitable cut-outs in the ends of the units make for ease in handling the cabinets.

Sinks, Drains, and Bench Tops

All laboratory sinks are made of a new material developed at the Institute. This new ware is a fired ceramic material with the pores filled with bitumen, the volatiles of which are expelled, leaving only coke or carbon. Because of the low firing temperature, this ware is straighter than in the case of a vitrified body. Two types of sinks are used, one for mounting under the bench top and one for installation at the end of the center bench. The first type measures 21 by 18 inches by 6 inches deep. The second is a double drainboard type measuring 52 by 20 inches overall, and having a basin 24 by 18 by 8½ inches. Each type has an integral tailpiece and a strainer. Drain lines are chemical stoneware, except in a few places where pipe of the new material was used. Cup sinks formed by extending a vertical drain pipe from the horizontal line up to the underside of the bench top are used instead of troughs for condenser discharge, etc. A vented trap is installed for each bench at the point where the horizontal drain enters the stack, which passes through the floor slots at the window end of the room, as pointed out.

Bench tops are in general "Alberene" stone, 1½ inches thick, 30 inches wide for the wall benches and 56 inches wide for the center bench. Some benches, however, are topped with a novel material similar to that described above, except that cordierite is used in the manufacture, which lowers the coefficient of expansion of the material to a point where it will stand extreme local heating without fracture. In some special laboratories stainless steel tops and tops of ¼-inch steel plate are used.

Fig. 8—Detail of laboratory bench, showing sink in place

Fig. 9—A laboratory storage cabinet

Service Pipes

Each laboratory is provided with outlets for hot, cold and distilled water, compressed air, vacuum, gas, and steam. Copper pipe is used for hot and cold water, aluminum for distilled water, and black steel for air, vacuum, gas, and steam. The smallest size pipe used is ½-inch. On the wall benches the service pipes are brought up from the mains under the window stools through the bench tops and carried along the walls over the benches, supported by the vertical T-slots. In the case of the center-type benches, the pipes are carried under the tops on hangers supported by the lugs on the back of the vertical bench framing members. The outlets on the center benches are in the form of turrets located on the ends of the benches. The turrets are made of anodic finished aluminum and contain electrical outlets and also the services referred to. The turret on the free end of the bench also contains the hot and cold water faucet for the double drainboard sink. The faucets for the sinks in the wall benches are supported by the service pipes above the bench top. For obvious reasons, the distilled water outlet is not placed over a sink, but directly over the bench top. Two outlets for steam are provided on the wall bench—one in the hood and one near the sink. The steam service line is carried entirely beneath the bench top except where it is brought through the top for wall bench outlets or to the turret on the center bench. All stopcocks are of a white metal alloy, not plated, and are equipped with colored synthetic resin indices. Special combination offset elbows and unions are used at the window ends of the service lines on the wall benches, which makes

for easy removal of the lines for cleaning or alteration.

Electrical Service

The wiring scheme used in the Institute is known as the 3-phase 4-wire system. It supplies current of 115 or 200 volts single-phase or 200-volt three-phase. Suitable receptacles are located in the turrets on the center bench and in a wiring trough directly above the service pipes on the wall bench. The wiring trough is one of the new features in the Institute's equipment and consists of a formed anodic finished aluminum trough measuring 2½ inches square with a snap cover to close the top. Holes are cut in the front face on about 21-inch centers for receptacles installed on the inside of the trough and therefore requiring no finish plates. The wiring trough is connected to the conduit system of the building at the window and of the laboratory in a manner similar to the service lines. A majority of the receptacles are for 115 volts single-phase, but many are connected to all four wires of the system, thus providing any of the three types of current mentioned. By the use of the wiring trough it is easy to change any receptacle at will. The table circuits and lights in the laboratories are controlled by de-ion circuit breakers in laboratory panel-boxes near the entrances to the rooms. In addition to the alternating current service described, a special pair of wires is carried into each laboratory and connected to a plug system located in the nearest electric shaft. From the shaft plug-board, trunk lines lead to a master plug-board in the motor-generator room on the first floor. Through this system any laboratory can be supplied with any type of current of which a source is available. Only one outlet for special current is provided in each laboratory, but this can be quickly moved to any position in the wiring troughs.

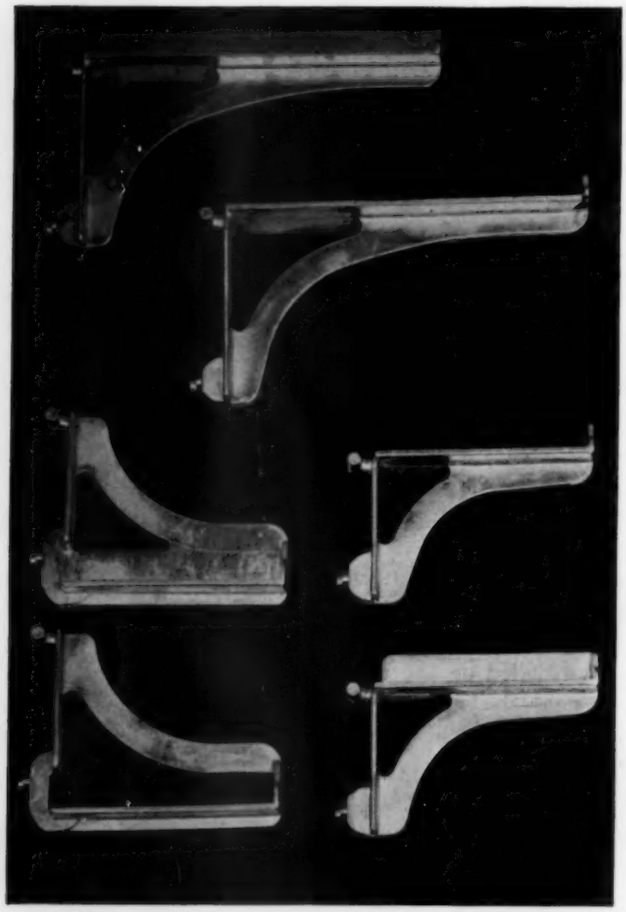


Fig. 10—Adjustable shelf brackets of die-cast aluminum

Shelving

Mention has been made of the adjustable shelving in the description of the wall T-slots. The shelf brackets are of aluminum cast in a permanent mold and thus require no fitting. The lower bracket, which is installed directly over the wiring trough, is of the inverted type so that the first shelf will be as low as possible. Ordinarily, the first two shelves are 7 inches wide, and the top shelf is 12 inches wide. Brackets are made with and without a dividing member, so that, where necessary, end shelves may overhang the last bracket. The brackets are fitted into the T-slots by turning the bracket on its side, engaging a T-lug at the top of the bracket, and then turning the bracket upright and finally engaging a pin on the lower part of the bracket in one of the punched spaced holes in the back of the T-slot. The shelves themselves are made of impregnated asbestos board finished with an acid-resisting lacquer. The shelf brackets have been found useful in the paper and textile testing room for supporting rods on which yarn is hung for conditioning.

Besides the die-cast brackets, sand-cast brackets for shelves 18 inches wide have been provided, being used for balance shelves on the corridor end of the large laboratories and for animal cages in some of the nutritional or pharmacologic research rooms. It has probably occurred to the reader that wall T-slots must have been placed pretty generally throughout the building. As a matter of fact, they were installed on all available wall space wherever there was any possibility of their being needed. They are placed in shops and large-scale experiment rooms as well as in laboratories.

Laboratory Desks

Special laboratory desks were designed for the small laboratories and for the offices of the large laboratories. These desks are 43 inches long and 30 inches wide. The top overhangs 5 inches at the back to clear the service pipes and drain for the adjacent chemical bench in the small laboratories. The desks

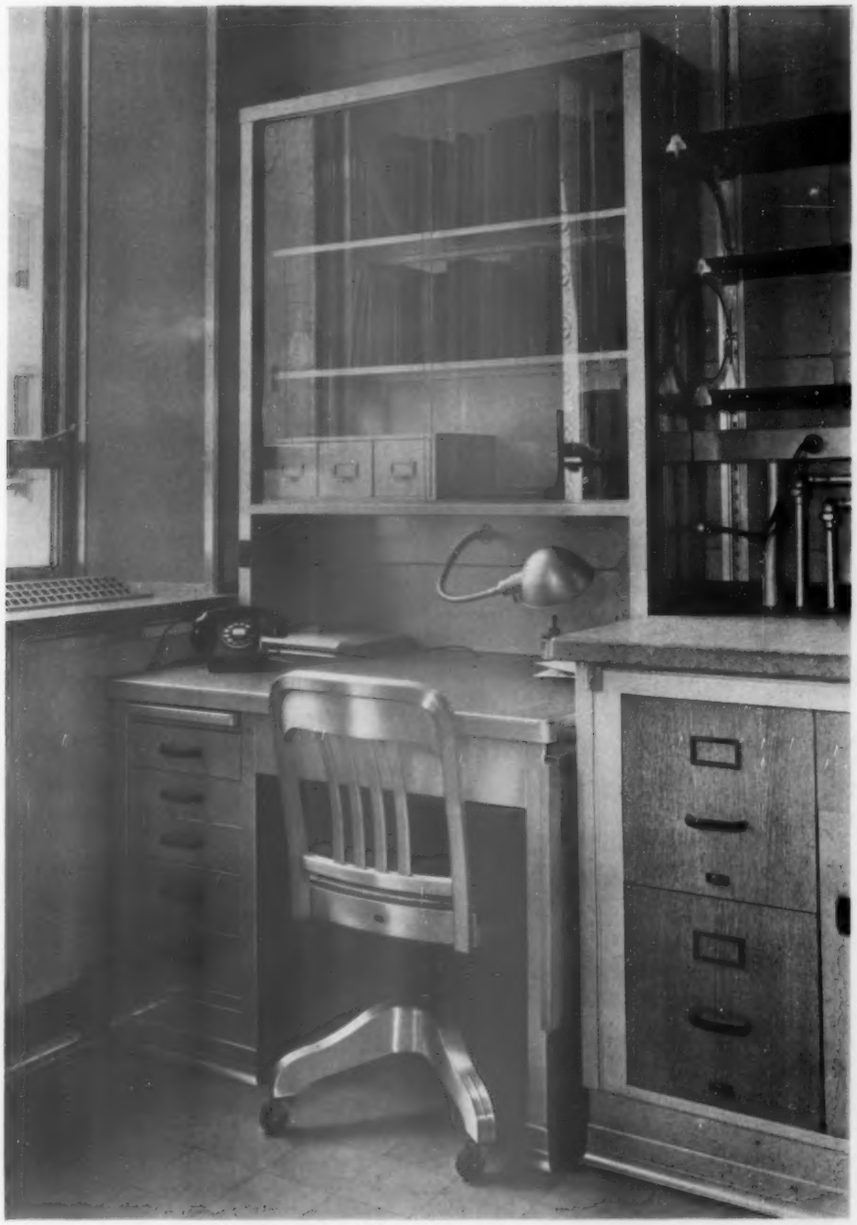


Fig. 11—The specially designed laboratory desk

have a single pedestal on the left-hand side, but in the small laboratories the effect of a double pedestal is obtained by the use in the first section of the chemical bench of a special cabinet, which contains two letter-file drawers, a card-file drawer, and a storage cupboard. Above the desk is a bookcase section with sliding plate-glass doors and adjustable shelves. The desk is equipped with a light, a receptacle for attaching microscope lamp, etc., a sliding shelf with glass insert for reference table, etc., a convenience tray in knee space drawer, a drawing board on the end of the desk, and removable card-file sections to fit in the bookcase. The desk is wired through from end to end so that in the large laboratory offices two desks may be connected together and to one outlet in the underfloor duct. New type telephones are used with the ringer box in the base of the instrument; hence it was necessary only to provide a bushed hole in the desk top for the installation of a telephone. The telephone lines are brought to each laboratory through an underfloor duct system. The desk unit is constructed of lead-coated steel with a baked aluminum finish. Desk tops are of brown linoleum.

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For use in school laboratories the General Electric Company has given special attention to the design and manufacture of various instruments, machines and devices that embody the characteristics of the corresponding commercial types, but in smaller sizes and ratings, at less expense.

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ELECTRIC MEASURING INSTRUMENTS

No apparatus in the college laboratory is of more importance than the electric measuring instruments. A well-equipped laboratory will need an assortment of standard instruments of all types and capacities, since there is hardly an experiment performed by the students which does not require their use.

The satisfaction and benefit derived from these laboratory experiments depend to a very large degree upon the **accuracy** of the instruments. There is nothing more discouraging to the student than to find that his results do not check. For this reason, when selecting laboratory instruments, too much care cannot be given to accuracy, permanence of calibration, dead-beat indications, and legibility of scales. Of course, local disturbances should not influence readings and, in many cases, low internal losses are important. If, added to these features, instruments of structural simplicity and fine appearance can be procured, one important problem facing the laboratory director will have been solved.

In the design and construction of G-E electric measuring instruments, careful consideration is given to all these details. The instruments described on the following pages have been selected from a wide range of the Company's products as being most suited to school laboratory use.

General Electric, aware that electric laboratory instruments are subjected to extremely rough usage in the hands of inexperienced students, offers a prompt and complete repair and recalibration service to college and technical schools at cost.

PORTABLE INSTRUMENTS

Type P-3
Alternating Current

Type P-3 instruments are designed and built to give long, dependable service at high accuracy. They comprise a full line of ammeters, voltmeters, single-phase and polyphase wattmeters, frequency meters, power-factor meters, and a single-phase wattmeter for low-power-factor measurements—each of the above covering the usual ranges of current, voltage, frequency, etc. The instruments excel in mechanical construction, are neat in appearance, and very substantial. They are enclosed in neat walnut carrying cases, approximately 5½ by 8½ by 8¼ inches, with removable hinged covers, snap locks and leather handles.

Accuracy: The P-3 instruments, with the exception of polyphase wattmeters, are correct to within 0.2 per cent of full-scale values on direct currents, and on alternating currents of any frequency up to 133 cycles per second, if the scale corrections are applied. The accuracy variation of the polyphase wattmeter is 0.5 per cent.

VARIATION PER DEGREE C. AMBIENT RISE

	Per cent
Wattmeters	
50/100 volts	0.003/0.009
100/200 volts	0.008/0.009
200/400 volts	0.010/0.012
Ammeters	
5/10 amperes	0.016
Voltmeters	
75/100 volts	0.002/0.006
150/300 volts	0.006/0.010
300/600 volts	0.005/0.006

Scales: Scales subtend an arc of approximately 90 degrees and are approximately 6½ inches long. They are very legible. Attached to inside of cover of each instrument case is a calibration certificate.

PORTABLE INSTRUMENTS—cont.

Type DP-2
Direct Current

Type DP-2 instruments comprise a complete line of high-grade direct-current instruments obtainable in the same classifications as the alternating type, as mentioned on the preceding page. All DP-2 instruments utilize the well-known d'Arsonval element. They are built complete in a polished walnut case with hinged cover, snap catch and leather handle, 8 by 8 by 4½ inches overall.

High Accuracy

Types AP-9 and DP-9
Medium Size
For Alternating and Direct Current

Type AP-9 Voltmeter

Types AP-9 and DP-9 instruments are of medium size, for general laboratory and testing work. They are available as ammeters, voltmeters and single-phase wattmeters in a wide range of ratings. The case is of attractive, durable molded Textolite, and the long scale (4.1") is equipped with a mirror which, in conjunction with the knife-edge pointer, practically eliminates errors due to parallax. The accuracies of the Types AP-9 and the DP-9 are within ¾ of 1 per cent, and ½ of 1 per cent of full scale value, respectively. An external zero adjuster is provided on the outside of the case. **For further information, ask for GEA-1784.**

Combination volt-wattmeters are also available. One is rated 150 volts, 500 watts, and has a convenient plug and socket connector to adapt it for testing home appliances. Other ratings are also available.

Types AS-5 and DS-5

Types AS-5 and DS-5 are also well adapted for work in freshman or sophomore laboratories or shops of vocational or technical high schools. The molded-compound case is $5^{15}/_{32}$ by $3^{7}/_{16}$ by $1^{31}/_{32}$ inches. The scale length is approximately 3 inches, and the accuracy is within 1 per cent of full-scale value. All instruments are equipped with zero-adjusting devices with readily accessible operating screw projecting through the case.

Type AS-5 Voltmeter

Both the AS-5 and the DS-5 types are made with the multiple rating, or double scale, and with but one pair of terminals. The transfer from one scale to the other is accomplished by means of a cylindrical switch located between the two binding posts. **Type DS-6** instruments are also available, constructed with a d'Arsonval movement and a copper-oxide rectifier for use on both alternating and direct current. **For complete details, ask for GEA-305.**

SMALL PANEL INSTRUMENTS

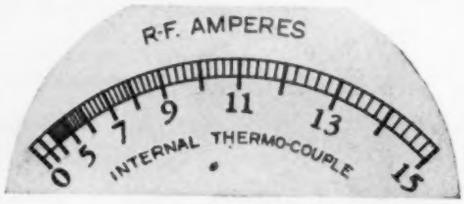
Alternating and Direct Current

This line of instruments includes voltmeters, ammeters, milliammeters and microammeters **(Types AO and DO).** Accuracy is within 2 per cent of full-scale value. Cases are of durable molded Textolite. Applications include welding sets, battery-charging panels, radio test sets, etc. Type AO-21 or DO-40 is supplied with a universal-type case, for flush or surface-mounting. Type AO-22 or DO-41 has a wide flange for flush mounting; diameter over flange, 3½ inches. **Ask for GEA-1239B.**

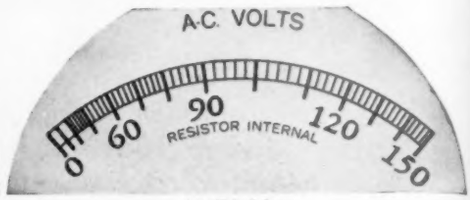
Portable Stand for 3½-Inch Instruments

TYPICAL SMALL PANEL INSTRUMENT SCALES

60 Divisions



75 Divisions



40 Divisions

SWITCHBOARD INSTRUMENTS

Rectangular Type
For Alternating and Direct Current

G-E rectangular-type switchboard instruments include voltmeters, ammeters, wattmeters, power-factor meters, and frequency meters, for alternating current **(Type AD-6);** and voltmeters and ammeters for direct current **(Type DD-6).** These instruments are of the highest quality; the accuracy of the voltmeters, ammeters and wattmeters is within 1 per cent of full scale.

Rectangular

Other features include: dull-black finish metal case, antiparallax scale and pointer, antiglare glass; long, clearly marked scales (5.1″); magnetic damping, high torque, and attractive appearance. **For complete description, ask for GEA-1758.**

GALVANOMETERS

Galvanometer

Portable galvanometers for laboratory use are available in a wide variety of ratings and sensitivities. The illustration shows a galvanometer with lamp and scale enclosed in a cast-aluminum alloy case. Other styles, using a pointer instead of a light beam, are available.

PHASE-ROTATION INDICATORS

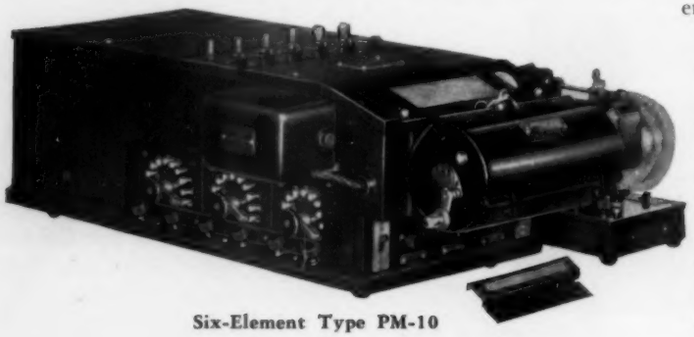
This new **phase-rotation indicator** is a sturdy, reliable instrument for quickly checking the phase sequence or rotation in an unknown circuit. The size is 3 by 3½ by 5½ inches, and the weight only 22 ounces. There are no moving parts, since all indications are made by neon glow tubes. Operation is quick and dependable.

Phase-Rotation Indicator

PERMANENT MAGNET OSCILLOGRAPHS

The six-element, general-purpose oscillograph, Type PM-10, is designed for convenience in operation under all test conditions. It is furnished with six galvanometers for current or potential measurements, and a timing vibrator provides a seventh record when it is desired. Watt galvanometers, interchangeable with potential galvanometers, are available.

This oscillograph is suitable for use in the laboratory or in the field. It produces records 3⅝″ or 6″ wide, either in a magazine film holder giving 3 or 5 exposures on a roll film, or in continuous-drive film holder giving continuous records up to 20 feet in length. A continuous-drive record paper holder is available, which gives records up to 100 feet in length.



Six-Element Type PM-10

The Portable two-element oscillograph, Type PM-12, is entirely self-contained. This instrument meets the needs of schools and colleges where it is desired to show two simultaneous records on a viewing screen. It also provides means of making inexpensive oscillograms of recurrent phenomena.

A magazine film holder is included with this instrument. A continuous-drive film holder for use in recording transient phenomena can also be furnished.

Two-Element Portable

PORTABLE CURRENT AND POTENTIAL TRANSFORMERS

Current and potential transformers are required when it is desired to extend the range of any instrument or to insulate it from the line voltage.

Type E-6 portable potential transformer is small and as light in weight as is consistent with a high degree of accuracy. It is rated 25 volt-amperes, and can be furnished for either 25 or 60 cycles and for voltages up to 2300 volts.

Type P-3 current transformer is supplied as either a triple-range or six-range transformer up to a maximum rating of 200 amperes. Changes in rating are made by suitable connecting links on the top of the transformer.

Type PR-1 Current Transformer

Type PR-1 portable current transformer, illustrated, covers a range up to 1000 amperes and, for higher ampere ratings, **Type R-3** transformer is supplied up to 1600 amperes.

A complete line of current and potential transformers for switchboard mounting is also available.

POTENTIOMETERS

Extreme accuracy in the measurement of small potentials is obtained by using a **precision potentiometer.** This is accomplished without drawing any current from the source to be measured. This potentiometer will measure voltages down to one microvolt.

Precision Potentiometer

The **deflection potentiometer** is especially useful in measuring both voltage and current with a high degree of accuracy. This potentiometer can be operated more rapidly than the precision type.

The **thermocouple potentiometer** is used to measure the **emf** of thermocouples. This does not draw any current from the thermocouple and therefore is the most accurate means of measuring a thermocouple output.

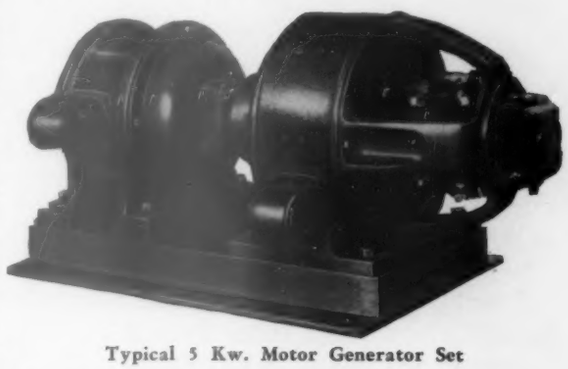
ELECTRON TUBES

The importance of electron tubes nowadays needs hardly be mentioned to the technical educator. It may be said that electron tubes are revolutionizing the electric industry. All types of electron tubes are available.

ALTERNATING-CURRENT GENERATOR AND MOTOR

AHI Synchronous Generator, 6 Pole—5 Kva (4 Kw., 8 Pf.)—110/220 V., 1, 3 or 6 Phase—1200 R.p.m.

Type AHI alternating-current generator, illustrated, has long been the standard for teaching the fundamentals of alternating currents. Its flexibility permits its use in a very wide variety of laboratory experiments. It is now manufactured in two ratings which conform closely to standard commercial machines, but modifications make it ideal as a school demonstrating unit.



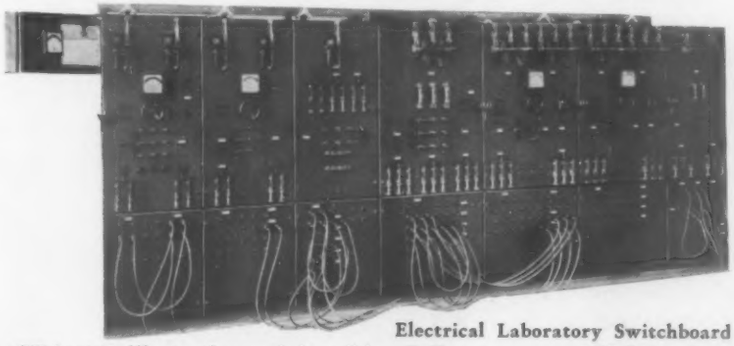
Typical 5 Kw. Motor Generator Set

Type AHI is designed to run as an alternator or synchronous motor. Extra rotors are available which, when substituted in place of the salient pole rotor, convert the machine into a squirrel-cage induction motor, a phase-wound-rotor induction motor or frequency converter.

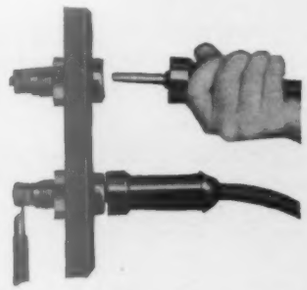
A phase displacement set and a phase displacement dynamometer set have been developed around the rating illustrated. These two unit sets are designed specially for laboratory use.

SWITCHBOARDS FOR LABORATORY SERVICE

General Electric has developed a switchboard to meet the needs of the technical school laboratory which provides maximum flexibility. This board provides for parallel operation of a-c and d-c generators, under standard conditions, and it supplies the laboratory with a very effective and variable feeder system. A great asset to this feeder system is the plug switch also here illustrated, used extensively throughout the board. This facilitates making and changing connections and saves times and trouble in shifting power to circuits where needed.



Electrical Laboratory Switchboard



Laboratory Plug Switch, CR-1939

Bulletin GEA-1185, illustrating and describing G-E apparatus particularly adapted to school and college laboratory use, is available on request. Also booklets on construction projects as follows:

GES-909: Construction Data, ¼-hp. Single-phase Induction Motor
GEA-2138: Construction Data, ¾-hp. Three-phase Induction Motor
GEA-2140: Construction Data, ½-hp. Single-phase Induction Motor
GEA-2289: Construction Data, 250-watt 125-volt d-c Generator
GET-569: Construction Data, Transformer Rated Natural Draft, 60-cycles, 1½-kv-a; Primary Volts, 220; Secondary Volts 55/110

(Kits for these projects can be purchased from the General Electric Company.)

Complete information can be obtained from our nearest sales office.

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IF YOU require **any** kind of electrical measurements in your laboratory you'll find a suitable G-R instrument or part backed up by over twenty-one years of experience in pioneering high-quality laboratory apparatus.

General Radio apparatus and accessories are used in the leading educational, governmental and industrial laboratories throughout the world. General Radio products are noted for the care taken to insure ahead-of-the-times design, correct engineering, careful manufacture and rigid inspection.

Here is a partial list of G-R instruments, all of which you should know more about:

BRIDGES—general-purpose, direct-reading Schering, radio frequency, inductance, megohm meter, skeleton universal, vacuum-tube.

LABORATORY STANDARDS—both fixed and variable standards of capacitance, inductance and resistance in a wide range of sizes and ratings.

OSCILLATORS—a-c and battery-operated beat-frequency, tuned circuit and electro-mechanical.

AMPLIFIERS—a-c and d-c operated with high gain, wide frequency range and flat frequency characteristics.

WAVEFORM MEASUREMENTS — oscillographs, high-speed moving-film cameras, modulation and distortion meters, wave analyzers and filters.

FREQUENCY MEASUREMENTS — standard-frequency assemblies, interpolation and auxiliary equipment, secondary frequency standards, piezo-electric oscillators, multivibrators, frequency deviation meters, frequency limit monitors, heterodyne frequency meters, quartz plates, precision tuning forks, electronic audio-frequency meters, precision and general-purpose wave-meters, synchronous clocks.

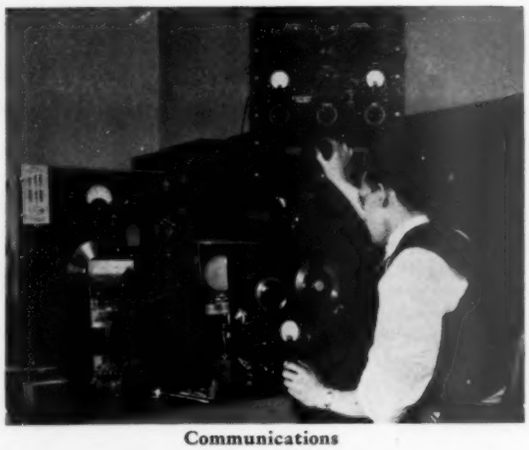
INDUSTRIAL MEASUREMENTS — stroboscopes for motion observation and speed measurements, sound level meters.

MANUAL VOLTAGE CONTROLS — fourteen models of the VARIAC continuously adjustable auto-transformer for all kinds of fine a-c voltage control.

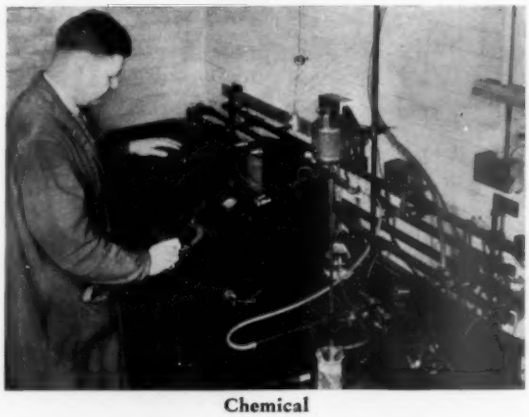
STANDARDIZED PARTS—variable and fixed air condensers, plug-in coils, rheostats and potentiometers, oxide rectifiers and thermocouples, audio-frequency transformers, relay racks, dials, knobs, switches, binding posts, plugs and jacks.

Investigate the complete line of G-R apparatus

WRITE FOR BULLETIN 193
for Complete Information



Communications



Chemical

Electrical

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Types 501, 502, 504 and 520

TYPE 501 MICROAMMETERS, MILLIAMMETERS, MILLIVOLTMETERS, and VOLTMETERS

Single Ranges—
From 2 microamperes to 1 ampere, full scale.
From 1 millivolt to 1000 volts, full scale.

Multi-ranges—
From 4 microamperes to 1 ampere, full scale.
From 2 millivolts to 1000 volts, full scale.

Multimeters—14 Ranges—
1 microampere to 1 ampere. 20 microvolts to 1000 volts.

TYPE 502 THERMAL A.C. MILLIAMMETERS and VOLTMETERS

Can be used on A.C. or D.C.

Single Ranges—
From 1 milliampere to 1 ampere, full scale.
From 0.25 volt to 1500 volts, full scale.

Multi-ranges—
From 2 milliamperes to 1 ampere, full scale.
From 0.3 volts to 1500 volts, full scale.

Multimeters—14 Ranges—
From 2 milliamperes to 5 amperes.
From 60 millivolts to 1500 volts.

TYPE 515 THERMOCOUPLES

In Vacuo—From 2 milliamperes to 1 ampere.
In Air—From 0.5 amperes to 10 amperes.
Specials—For use on short wave frequencies.

TYPE 504 FLUXMETERS

For measurement of magnetic flux in maxwells or gausses, with electrical zero return. These are strictly portable and need no leveling.

TYPE 505 SWITCHBOARD PATTERN METERS and TYPE 507 SMALL METERS

Type 505

Type 507

Same ranges as Type 501. These cannot be supplied with internally mounted thermocouples.

TYPE 520 WATTMETERS—From 0.1 watt full scale up. Especially suitable for use on circuits having low power factors.

TYPE 520 DYNAMOMETER MILLIAMMETER and VOLTMETERS—From 10 milliamperes and 0.5 volt up; full scale.

OHMMETERS, TYPE 701—With self-contained battery and magnetic shunt to compensate for battery ageing. Suitable for measuring low coil resistances up to insulation resistance in megohms.

TYPE 704—Cross coil, independent of ± 20% battery ageing. From 1 ohm to 1000 megohms.

TYPE 508 ELECTROSTATIC VOLTMETERS

No power consumption on D.C. and very little on A.C. Full scale ranges from 120 to 3000 volts and up to 40,000 volts by the use of condenser multipliers. Measures true R.M.S. values. Special high ranges built on request.

Type 508

TYPE 503 SEMI-SUSPENDED MICROAMMETERS, MILLIAMMETERS and MILLIVOLTMETERS

The most sensitive portable meters manufactured. Although movement is carried on a suspension, the meter needs no leveling. Full scale ranges from 0.5 microampere and 0.1 millivolt up. Also supplied in multiranges.

Type 5053 — Similar to Type 505 but with semi-suspension element. Ranges from 0.75 microampere and 0.24 millivolt up.

Type 5073 — Similar to Type 507 but with semi-suspension element. Supplied in same ranges as Type 503. Price approximately 30% less than Type 503.

503

NEW DEVELOPMENT RAWSON TWIN MULTIMETER

Occupies less space than any other near equivalent meter. Covers all ranges of types 501 D.C. multimeter and 502 A.C. multimeter—29 in all.

Type 5012
Size 12″ x 8″ x 6″

WESTON ELECTRICAL INSTRUMENT CORP.

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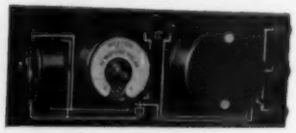
WESTON—THE WORLD'S STANDARD IN ELECTRICAL MEASUREMENT

The use of WESTON instruments in educational work and scientific laboratories has become a fixed principle, for nothing short of WESTON accuracy and dependability are acceptable for engineering training. WESTON instruments are made to most exacting standards of craftsmanship and accuracy. They inspire students to be exact in experiments. And in using WESTONS in training, the student is familiarizing himself with the instruments he will use all through his engineering career, for student graduates since 1888 have "Westonized" the industrial world.

Illustrated are a few of the many WESTON models particularly recommended for educational use. Catalogs describing all models are available.

MODEL 607 * Photronic Photoelectric Relay



Ideal to demonstrate the theory and operation of photoelectric cells and sensitive relays. Consists of a WESTON Photronic Cell of the self-generating type, a WESTON Sensitive Relay and a Power Relay. The cell has permanent electrical characteristics and unlimited life. No outside voltage, nor troublesome amplifier required. All mounted on a common base and wired. Wiring diagram engraved on base. Low priced.

MODEL 622

Ultra-Sensitive Microammeters, Millivoltmeters

Double pivoted type instruments—requiring no leveling—for measurement of minute currents. Low ranges down to 5 microamperes statically shielded. Ranges up to 20 microamperes magnetically and statically shielded. Ideal for laboratory work and circuits involving thermo-couples, pyrometers, electron tubes, etc.

MODEL 280

Miniature Precision D.C. Instruments

Most convenient and practical for student use, combining miniature size and WESTON ruggedness. Size 4⅖ x 4⅗ x 1½ inches. Accuracy 1% . . . hand calibrated mirror scales and knife-edged pointers . . . shielded from external magnetic fields. Available in multi-range instruments so that a variety of testing can be done with one instrument.

MODEL 430

Portable, Precision A.C. and D.C. Instruments

Universally used in schools and throughout industry wherever rugged, portable instruments are required for general testing. Hand calibrated, mirror scales with knife-edged pointers. Size 5$\frac{1}{16}$ x 6$\frac{1}{32}$ x 3½ inches. The line includes D.C. instruments, A.C. instruments and single phase Wattmeters.

MODEL 375 — Student Galvanometer

Model 375 is widely used in school laboratories where durability and low cost are prime requirements, rather than extreme sensitivity. Sensitivity 22 microamperes per division, resistance 23 ohms.

Model 699 Galvanometer is recommended where medium sensitivity is required . . . and the Model 440 wherever an exceedingly sensitive instrument is required. Complete literature on all models available.

*** Photronic—A registered trademark designating the photoelectric cells and photoelectric devices manufactured exclusively by the Weston Electrical Instrument Corporation.**

EDISON STORAGE BATTERY

DIVISION OF THOMAS A EDISON, INCORPORATED

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EDISON NICKEL-IRON-ALKALINE STORAGE BATTERIES FOR SCHOOL AND COLLEGE LABORATORY USE

EDISON Nickel-Iron-Alkaline Storage Batteries for school and college laboratories have two important advantages:

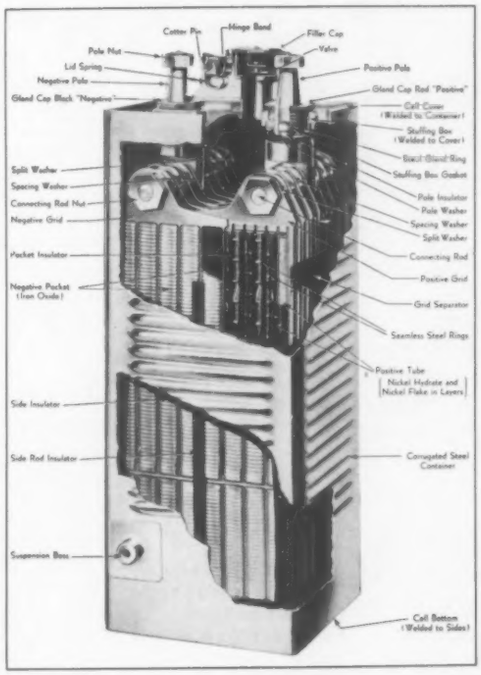
1. They are the most dependable and convenient source of d.c. for laboratory supply circuits.
2. They are the most extensively used type of storage battery in industry and hence the type with which the student is most likely to be concerned following graduation.

For D.C. Laboratory Supply Circuits

The Edison Nickel-Iron-Alkaline Storage Battery as a source of d.c. for laboratory supply circuits affords a dependability no other type of battery can approach. Use of steel for all structural parts combined with an alkaline electrolyte (which is a recognized preservative of steel) makes it practically indestructible and permits secure retention of all active materials within the plates.

Its charge and discharge results in the simple transfer of oxygen from one plate to the other. The fact that neither oxidation nor reduction, once completed, can be followed by further or other reactions, helps explain why it cannot be injured by overcharge, overdischarge, charge in reverse or other so-called electrical accidents.

These are some of the reasons for its great dependability, as well as its long life (2 to 5 times that of other batteries). Despite its higher first cost, it is the most economical battery to use.



Because of its all-steel cell construction the Edison Nickel-Iron-Alkaline Battery is the most durable made

A feature of especial value in school and college work is its ability to stand discharged during all vacation periods without need of attention and without suffering injury or deterioration of any kind.

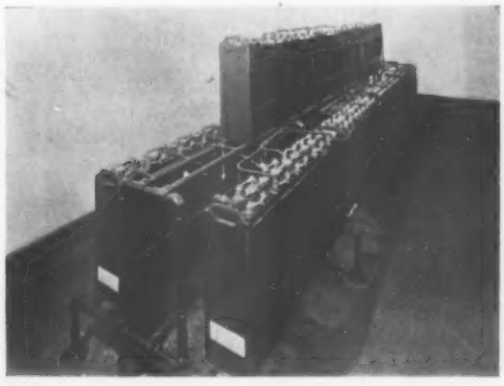
Another feature is the convenience of using any number of cells in a battery assembly to vary the voltage as desired. This may result in unequal discharge and subsequently in overcharge of some cells when the assembly as a whole is recharged. Unlike other batteries, however, the Edison Nickel - Iron - Alkaline Battery is not injured by such treatment.

As a Means of Training in Industrial Battery Applications

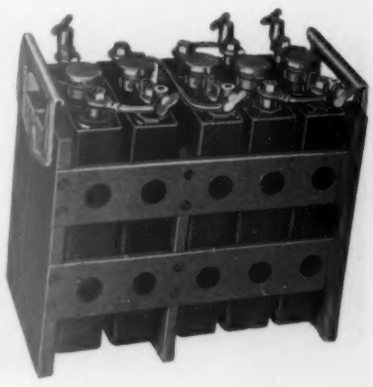
Practically every major industry in the United States uses battery industrial trucks for plant transportation and material handling.

Subways and other electrified railways use storage batteries for control purposes on locomotives and multiple unit cars. Mine locomotives, miner's electric cap lamps, ship's electric power stand-by, steam railway passenger car lighting and air conditioning are other important industrial storage battery applications. In all such services, Edison Nickel-Iron-Alkaline Storage Batteries are the type in most extensive use.

Instruction in their care, operation and construction is thus of very practical value to the student.



Typical stationary laboratory battery; consists of 100 A4H cells having a capacity of 150 ampere hours; through a switchboard the output of any number of cells is made available for experiments requiring variable direct current potentials



Typical portable laboratory battery; consists of 5 B2H cells having a capacity of 37.5 ampere hours; note special taps, supplied at no additional cost with this type of cell, which permit ready use of output of variable number of cells

THE ELECTRIC STORAGE BATTERY COMPANY

World's Largest Manufacturers of Storage Batteries for Every Purpose

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Cleveland, Ohio, 6400 Hermann Ave., N. W.
Denver, Colo., 810 14th St.
Detroit, Mich., 8051 W. Chicago Blvd.
Kansas City, Mo., 129 Belmont Blvd.
Los Angeles, 341 W. 18th St.
Minneapolis, Minn., 617 Washington Ave., N.
New Orleans, 428 Balter Bldg.
New York, N. Y., 23-31 W. 43rd St.
Philadelphia, Allegheny Ave. and 19th St.
Pittsburgh, Pa., Union Trust Bldg.
Rochester, N. Y., 642 Plymouth Ave., So.
St. Louis, Mo., 1058 So. Vandeventer Ave.
San Francisco, Cal., 6150 Third St.
Seattle, Wash., 1919 Smith Tower Bldg.
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INTERIOR
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Exide
BATTERIES

FOR
AUTOMATIC AND
INSTANTANEOUS
EMERGENCY LIGHT
AND POWER
See Page 152

Exide Batteries, the product of The Electric Storage Battery Company, are extensively used in the laboratories of the nation's foremost scientists, industrial research engineers, schools and colleges. Their performance records are the best testimony that can be offered as to their merit for laboratory services. The foremost characteristics of Exide Batteries are absolute dependability and sustained high voltage until end of discharge.

Flexibility

The operation of an Exide Battery is flexible. Cell connections to the battery can be arranged so as to give any desired voltage, with a wide range in discharge rates available at that voltage. By assigning a group of cells of the battery to a definite experiment, a constant voltage is assured which is free from disturbance or interference by any outside influence.

An Exide Chloride Laboratory Battery Cell Cut-away to Show Unique and Sturdy Construction, Sealed Glass Jar Assembly

Improved Design Simplifies Maintenance

Exide Batteries of the sealed glass jar type have been carefully designed and are carefully constructed for laboratory service. A deep sediment space is provided at the bottom of each cell. Posts and connections are adequate for extremely high discharge rates and inter-cell connectors are of copper heavily coated with lead.

The structural details of Exide Batteries assembled in sealed glass jars have been so refined as to eliminate all maintenance attention other than recharging and an occasional addition of water, which, with automatic cell fillers, becomes a simple task.

Long Life

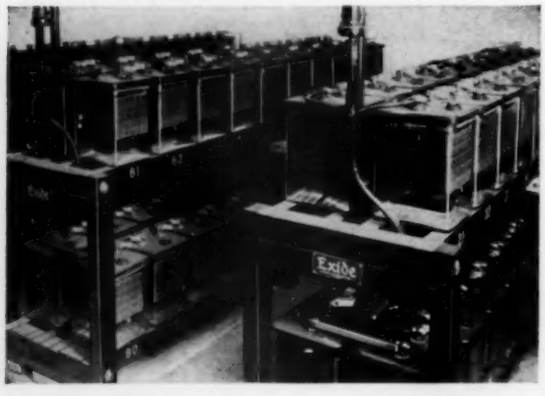
Exide Batteries are not only noted for their long life in laboratory service, but also in *all* types of industrial stationary service. *There are Exide-Chloride Batteries in laboratory and industrial installations which have been in constant use for 20 years and longer.*

For Any Budget

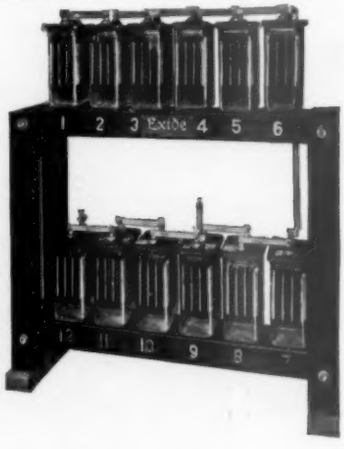
Regardless of how limited your budget appropriation, an Exide Battery can be selected to meet your requirements. They are available in a wide range of sizes and capacities, and can be installed so that cells may be added subsequently to obtain greater capacity.

Nation-wide Organization

We are prepared and equipped to help you with any laboratory battery problem which may present itself. The wide experience of Exide engineers and the services of our nation-wide Exide organization are at your disposal. Write to the nearest Exide office shown above for further information.



The Exide Chloride Battery in The Research Laboratory of Physics, Harvard University. It is Used for General Service Where Various Potentials from 2 Volts to 240 Volts Are Required



A Typical 12 Cell Exide Chloride Battery Widely Used in School and College Laboratory Work

KEWAUNEE MANUFACTURING COMPANY

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Kewaunee LABORATORY FURNITURE

PRODUCTS

Scientific Laboratory Furniture in Wood or Metal
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The Kewaunee Blue Book of Laboratory, Vocational and Home Economics Furniture
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PLANNING SERVICE

Available to our Clients without charge or obligation—Floor Plan Layouts—Mechanical Service Plans—Equipment Elevations—Specifications and Cost Budgets—Based on our 32 years of experience, exclusively in this highly specialized field.

A FEW OF OUR MANY RECENT OUTSTANDING INSTALLATIONS

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Carlisle Jr. H. S., Covington, Ky.
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U. of Ill. Med. and Dental Labs., Chicago, Ill.
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Chemical Labs. Lawrence Coll., Appleton, Wis.
Wyandotte H. S., Kansas City, Kan.
Sr. H. S., Miami Beach, Fla.
Univ. of Tenn. Biology Bldg., Knoxville, Tenn.
State Teachers College, Alva, Okla.
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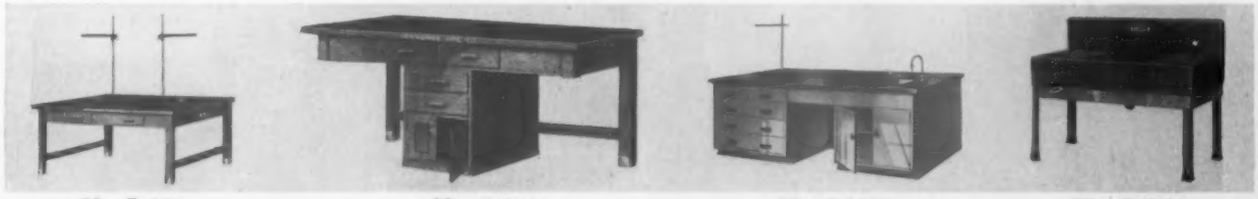
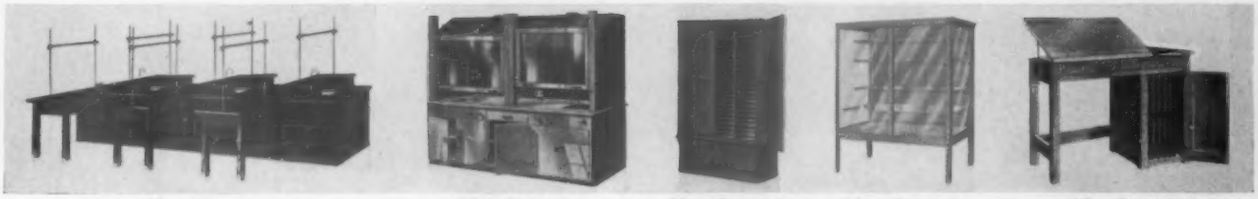
Let us show you how you can rehabilitate your present laboratories to accommodate an increased enrollment of students with modern, efficient equipment — at reasonable cost



No. B-201 Physics Table | No. C-304 Biology Table | No. S-1505 Instructor's Table | No. S-600 Karcite Sink



No. D-523 Lincoln Desk | No. S-1935 Fume Hood | No. G-1387 Notebook Case | No. G-1517 Trophy Case | No. L-2077 Art Table

THE GENERAL FIREPROOFING COMPANY

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Dealers Elsewhere. Write for Name of One Nearest You

Metal Laboratory Desks and Tables
Built-in Metal Cabinets, Fume Hoods, etc.

GF Metal Laboratory Desks and Tables possess many advantages not common to other types of tables. Doors and drawers never warp, swell or split. Handles never pull off. Drawers never stick to cause broken glassware.

Built on the unit principle to facilitate installation and repairs to plumbing. Of non-combustible construction, they reduce the fire hazards of laboratories. Continuous tops of soap stone, asbestos or other compositions that resist acids, alkalis and solvents.

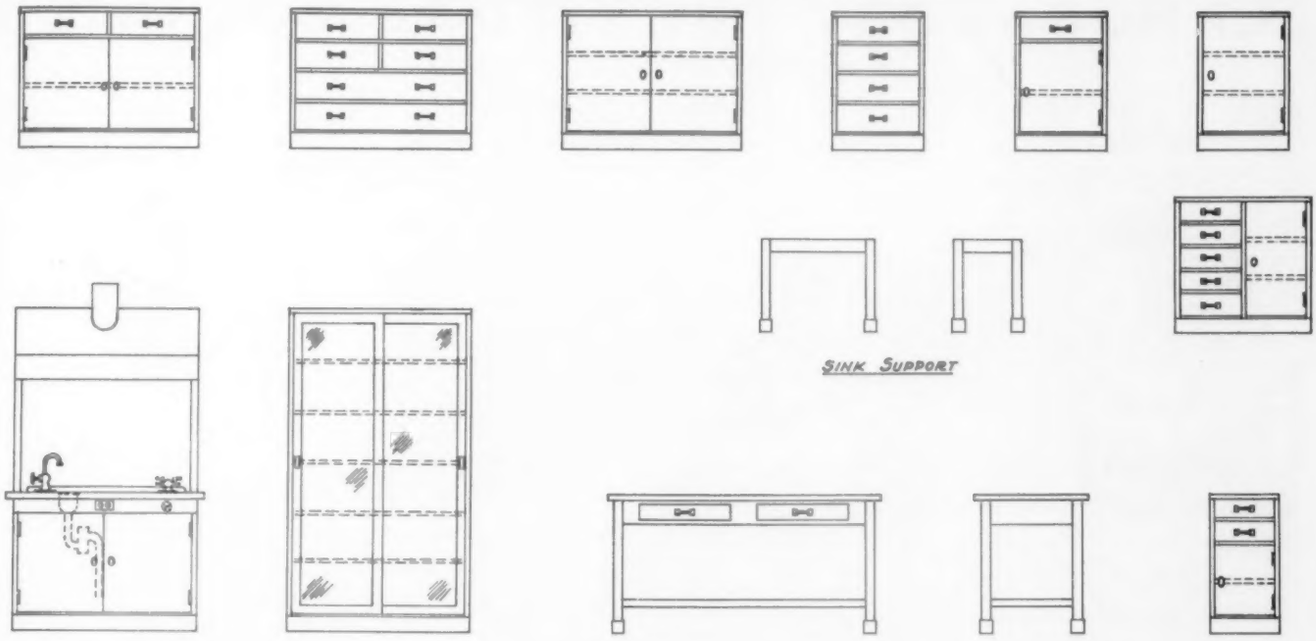
Complete engineering and consulting service for architects and building committees.

Chemical Laboratory, Princeton University

Los Angeles County General Hospital

Qualitative Chemistry, Ursinus College

Organic Chemistry, Ursinus College



TYPICAL LABORATORY UNITS

Research Laboratory, Aluminum Co. of America

Biological Laboratory, Ursinus College

Princeton University

Temple University

Temple University

LABORATORY FURNITURE CO., INC.

Manufacturers—Engineers

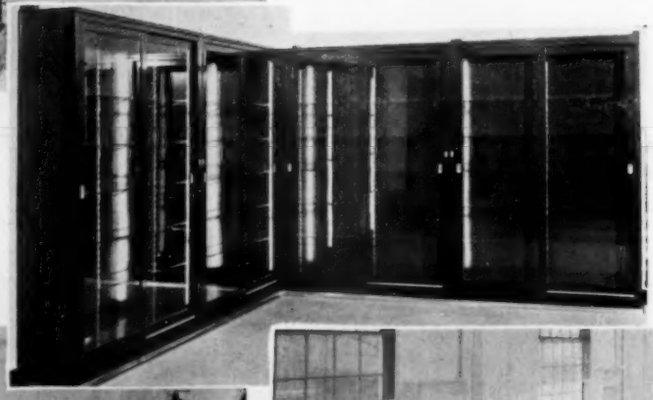
Long Island City, N. Y.

Medical College of Syracuse University, Syracuse, N. Y.
Dwight James Baum and John Russel Pope, Associated Architects

A "Steelab" Laboratory Furniture Installation is a Lifetime Installation

Chemistry Laboratory
Syracuse University

Like the modern building **"Steelab"** Furniture is built of steel and stone and is virtually indestructible by **fire, water** or **termites.** Unlike wood furniture it is unaffected by abnormal heat or moisture; the drawers and doors will never **warp** or **stick.** This durability and permanence is but one of a thousand reasons for **"Steelab"** popularity.



Museum Specimen
Cabinets
Syracuse University

Bacteriology Laboratory, Syracuse University

Histology and Embryology Laboratory, Syracuse University

Twenty Years of Design and Construction over 5000 Installations

Beauty
Utility
Permanence
Strength
Simplicity
Low upkeep

that's

"Steelab"

Science and Administration Building, St. Joseph College, West Hartford, Connecticut
Maginnis & Walsh, Architects, Boston, Mass.

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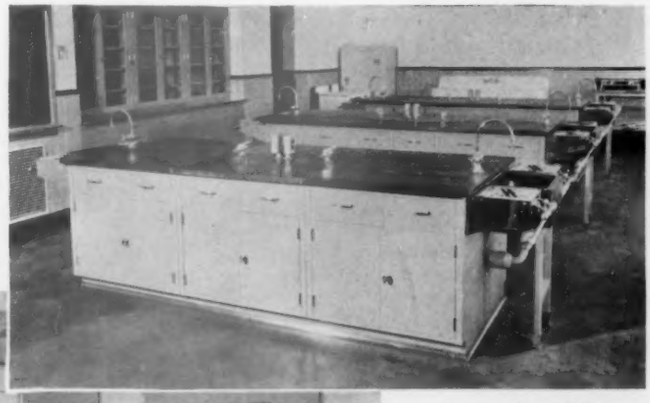
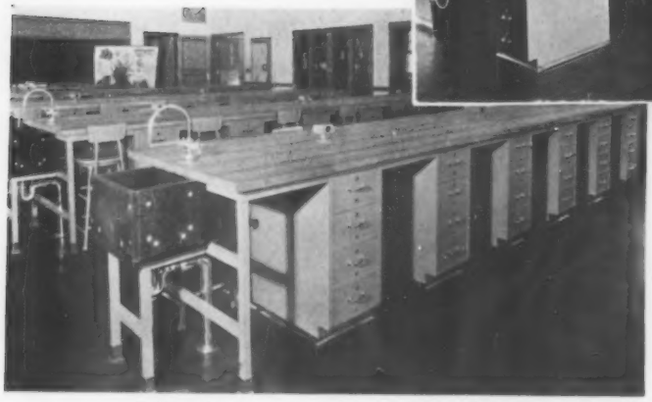
Chemistry Laboratory
St. Joseph College



Home Economics
Laboratory
St. Joseph College

Bacteriology Laboratory
St. Joseph College



Biology Laboratory, St. Joseph College

Low cost quantity production makes this Steel Laboratory Furniture available at a cost not exceeding the old-fashioned wooden furniture.

FREE — Engineering Service, Plans, Specifications and Budget Estimates. Avail yourself of the most modern ideas in Laboratory Planning without obligation. Write for catalog.

LABORATORY FURNITURE CO., INC.
LONG ISLAND CITY, NEW YORK

ALBERENE STONE CORPORATION OF VIRGINIA

Quarriers and Fabricators of Alberene Soapstone
Virginia Alberene Stone and Virginia Black Serpentine

419 Fourth Avenue, New York, N. Y.

Quarries and Mills at Schuyler, Va.

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ALBERENE SOAPSTONE

Natural quarried stone of medium hardness, produced and fabricated for more than 40 years; used in increasing quantities for:

Table Tops and Backs
Reagent Shelving
Fume Hoods, Gutters
Sinks, Drainboards
Tanks and Tank Linings
Toilet Partitions
Shower Compartments
Interior and Exterior Trim
Door and Window Sills
Fireplace Linings, Hearths
Spandrels

VIRGINIA ALBERENE STONE

Selected stone of extreme hardness, reserved exclusively for Stair Treads, Landings, Platforms, and Flooring. Abrasive tests show the highest durability factor on the U. S. Bureau of Standards scale of any natural stone commercially used for these purposes. Its siliceous nature makes it non-slip wet or dry.

VIRGINIA BLACK SERPENTINE

This natural stone is becoming extremely popular. Its great resistance to weather action makes it desirable for exterior as well as interior work. When sand-blasted (as in spandrels) the fine tracery of the designs stands out against the polished black surface.

VIRGINIA TREMOLITE GREEN

An interesting addition to the line. In honed finish, shows clear white markings. Polishes to a dark green.

PHYSICAL AND CHEMICAL PROPERTIES

All Alberene stone is homogeneous and finely granular in all directions, blue-gray in color, dense and non-stratified, chemically resistant, impervious and non-staining. Alberene soapstone is easily machined—bored, slotted, grooved, tongued, turned—without splitting or spalling.

METHOD OF CONSTRUCTION

Alberene laboratory fixtures are practically one piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corrosive metal cemented in grooves, with abutting slab edges sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented—permanently gas and liquid tight.

SERVICE IN DESIGN AND INSTALLATION

Every laboratory of major importance equipped in the past 40 years has used Alberene soapstone wholly or in large part. Out of this experience the company offers an advisory service, freely available to school and university authorities and architects.

MANUFACTURING FACILITIES

Quarries and mills at Schuyler, Virginia, are the largest in the world devoted exclusively to the production and fabrication of special purpose stone.

Section of Chemical Engineering Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y.

Virginia Alberene Stone Stair Treads and Platforms in Woodrow Wilson High School, Washington, D. C. Nathan C. Wyeth, Municipal Architect.

GENERAL CERAMICS COMPANY

Manufacturers of Acid-Proof Chemical Stoneware

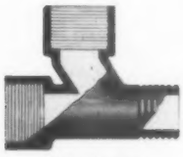
30 Rockefeller Plaza, New York, N. Y.

Buffalo Chicago Los Angeles San Francisco Tacoma Montreal

ACID-PROOF CHEMICAL STONEWARE LABORATORY EQUIPMENT

The Chemical Stoneware Division of General Ceramics Company makes a complete line of acid-proof chemical stoneware equipment for chemistry and physics laboratories in educational and research institutions, for general industrial chemical purposes, and for hospitals, electro-plating plants, newspapers, photo-engraving shops, and other establishments where corrosive fluids are used.

General Ceramics Chemical Stoneware Laboratory Equipment is widely used in educational institutions throughout the country. In fact, a list of the colleges and universities with chemistry laboratories equipped with General Ceramics Chemical Stoneware is practically a roster of our leading institutions of learning, including among many others Yale, Harvard, Vassar, Radcliffe, Duke, Pittsburgh, Wesleyan, Lehigh, Tulsa, Toledo, Berea, Purdue, Vanderbilt, McGill, California Institute of Technology, and the Universities of Maryland, Illinois, New Hampshire, Connecticut, Indiana, Pennsylvania, Ohio, Wisconsin, Nevada, California, and California at Los Angeles. General Ceramics equipment is used also in such buildings as the Walter Reed Hospital in Washington, the Curtis Publishing Company Building in Philadelphia, and in New York, the Times Building, Metropolitan Life Building, and United States Assay Office.



TY Fitting

Socket Pipe

Quarter Bend

The General Ceramics line of stoneware equipment includes laboratory sinks, drain lines and fittings, sumps, fume ducts, pumps, ventilating fans, and countless other items.

Description

General Ceramics Chemical Stoneware is a dense granite-like material with an attractive glazed surface. Both the glaze and the body of the ware are completely impervious to all acids and other chemicals, excepting hydrofluoric acid. The surface glaze is an integral part of the ware itself and therefore free from crazing and cracking. General Ceramics Ware is mechanically strong, leakproof, and easy to keep clean, and it cannot contaminate the chemicals handled. It lasts indefinitely and there is no upkeep or replacement expense.

Laboratory Sink with integral back and side. Can be furnished without back and side in various types and sizes

Laboratory Sink with double drainboard. Can be furnished also without the integral back, with single drainboard (either right or left), and with details of construction as required

Engineering Service and Catalogues

Our Engineering Department will gladly assist in selecting the right stoneware equipment for any requirements. We cooperate in laying out laboratories and other buildings where corrosive products are handled, also in the design of special chemical apparatus. A new bulletin on General Ceramics Laboratory Sinks will be furnished on request.

Specifications

Specifications should read as follows: "All parts of this installation subject to the action of acids or acid wastes are to be made of high-grade acid-proof chemical stoneware manufactured by the General Ceramics Company of New York."

MAURICE A. KNIGHT

Acid and Corrosion Proof Chemical Stoneware

227 Kelly Avenue, Akron, Ohio

New York Chicago St. Louis Detroit San Francisco
Cleveland Niagara Falls, N. Y. Toronto Montreal

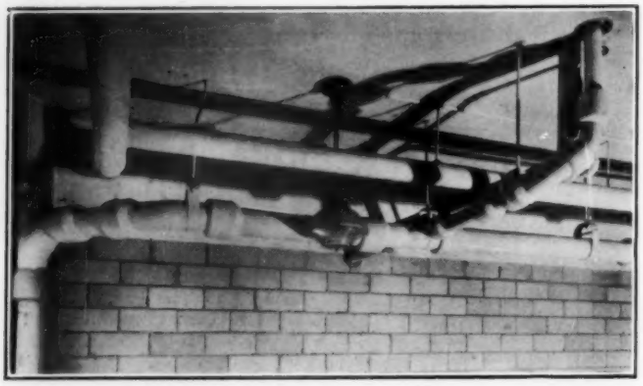
PRODUCTS

Laboratory Acid Waste Lines and Fume Ducts, Laboratory Sinks, Laboratory Table Troughs, Sumps or Dilution Basins, Jars, Filters, Tanks, Generators, Burner Guards, etc.

KNIGHT-WARE "IT IS THE BODY ITSELF"

GUARANTY

KNIGHT-WARE is guaranteed acid and corrosion proof, regardless of the strength or temperature of the solution, free from harmful defects and satisfactory in every respect.



KNIGHT-WARE Acid Drainage system at Temple University painted to conform to the interior decoration scheme

KNIGHT-WARE

KNIGHT-WARE is an improved ceramic product having a dense, uniform and thoroughly vitrified, tough body, wholly inert to the action of all acids and corrosive solutions (with the exception of those containing hydrofluoric), alkalies (except hot, concentrated caustics), and corrosive gases, weak or strong, hot or cold. No glazes, enamels or veneers are necessary to make KNIGHT-WARE acid proof—IT IS THE BODY ITSELF. KNIGHT-WARE is not brittle or fragile as ordinary tile and is equaled in chemical inertness only by glass and fused silica. An installation of KNIGHT-WARE properly made is trouble free and permanent.

KNIGHT-WARE LABORATORY SINKS

KNIGHT-WARE Sinks are custom built to suit your requirements and because they are entirely hand-made special features may be incorporated at only slight additional cost. One-piece construction means freedom from leaks. Smooth surfaces and well rounded inside corners make KNIGHT-WARE Sinks easy to clean and keep clean. The tough, vitreous body will not stain, slough or flake off or be attacked in any manner. Tailpieces are preferably furnished as an integral part of the Sinks but recesses to take separate spuds can be provided.

KNIGHT-WARE ACID WASTE PIPE AND FITTINGS

The bell and spigot design is usually used for laboratory drainage purposes and bores up to 60″ are available in this type. All standard fittings can be supplied and special ones fabricated to meet unusual conditions. Flanged and plain butt end connections can be furnished where desired.

KNIGHT-WARE JOINTS

KNIGHT-WARE B & S Joints can be either packed and poured or special PRESSURE-FLEX rubber sleeves are available. Either will afford an acid and leak proof job when done in accordance with our specifications.

KNIGHT-WARE ACID VENTILATING DUCTS

KNIGHT-WARE Ducts are furnished either round or rectangular in most any sizes. Bell and spigot, flanged, ground butt end and other types of connections are available. Since fume condensates are often more corrosive than the gas itself specify KNIGHT-WARE for positive protection.

LITERATURE AND SERVICE

Our fully illustrated KNIGHT-WARE Laboratory Equipment catalog will be sent upon request. We also offer you the knowledge and practical experience gained through scores of KNIGHT-WARE installations.

A FEW KNIGHT-WARE INSTALLATIONS

Many of the nation's leading universities are fully equipped with KNIGHT-WARE including such well known institutions as:

Columbia University
Princeton University
Purdue University
Ohio State University
Johns Hopkins University
West Virginia University
Wellesley College
University of California
University of Washington
University of Arkansas
McGill University
Mellon Institute of Industrial Research

KNIGHT-WARE Double Drainboard Laboratory Sink with continuous recessed Back—Figure 277-A

THE UNITED STATES STONEWARE CO.

Works (Since 1865): Akron, Ohio — NEW YORK OFFICE: 60 East 42nd Street

LOS ANGELES: Hollingsworth Building — CHICAGO: 20 N. Wacker Drive — SAN FRANCISCO: 116 New Montgomery Street

Acid-proof Chemical Stoneware Laboratory Sinks

"U. S. **Standard"** Acid-proof Sinks are widely used in laboratories of universities, schools, hospitals and industrial companies.

The construction is **one-piece,** without seams or joints. The material is non-porous and non-absorbent. The corners are well-rounded and the surface smooth. Special sizes can be made to fit any desired space.

Glaze—Our exclusive "Hy-Gloss" salt glaze has a high lustre, dark brown finish and is an integral part of the body itself.

Guarantee—Our products are unconditionally guaranteed to be acid, alkali and corrosion proof throughout the body, with or without the salt glaze.

Bulletin—Write for Bulletin No. 504 giving full information.

TRADE-MARK

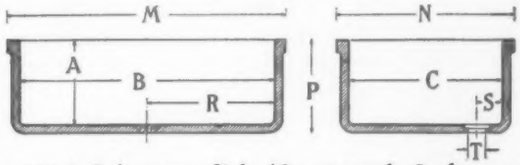


Fig. 112-A Laboratory Sink (Countersunk Outlet to take Metal Plug).

Fig. 112-ASP, Ditto, but with Integral High-Back.

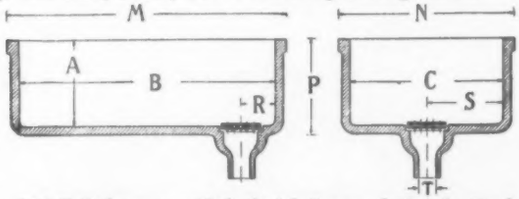


Fig. 112-B Laboratory Sink (with Integral Nipple Outlet and Removable Strainer).

Fig. 112-BSP, Ditto, but with Integral High-Back.

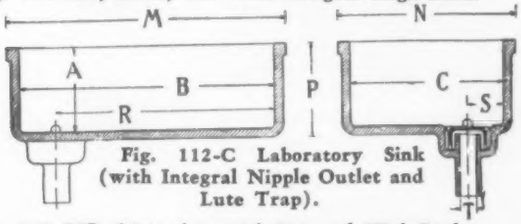


Fig. 112-C Laboratory Sink (with Integral Nipple Outlet and Lute Trap).

Fig. 112-CSP, Ditto, but with Integral High-Back.

DIMENSIONS OF "U. S. STANDARD" ACID-PROOF SINKS

Size No.	B	C	A	M	N	P	Code Word
700	11	9	8	14	12	9	Tab
701	14	10	6	17	13	7	Tacit
702	16	8	6	19	11	7	Tack
703	15	14	6	18	17	7	Taffy
704	16	12	6	19	15	7	Tag
705	16	16	9	19	19	10	Tale
706	18	10	11	21	13	12	Talon
707	18	14	7	21	17	8	Tamp
708	18	14	10½	21	17	11½	Tang
709	18	16	6	21	19	7	Tape
710	20	12	7	23	15	8	Tally
711	20	12	12	23	15	13	Tar
712	20	16	7	23½	19½	8¼	Taunt
713	24	15	8	27½	18½	9¼	Tenor
714	32	16	7	35½	19½	8¼	Terse
715	30	20	8	33½	23½	9¼	Thumb
716	36	18	7	39½	21½	8½	Tiger
717	42	20	12	45½	23½	13¾	Toast

Integral Backs on No. 700 to No. 709 sinks (dimension "E" on Fig. No. 112-ASP) are 8 in. high and are 10 in. high on the larger sizes. **Special sizes can be made to order.**

Other Products—Laboratory Table Troughs, Hemispherical Sinks, Sumps or Dilution Basins, Kjeldahl Equipment, Gas Generators, Laboratory Chlorine Cells, Suction Filters, Acid-proof Jars and Tanks, Burner Guards, Laboratory Jar Mills, Funnels, Exhaust Fans, etc.

Acid-proof Chemical Stoneware Piping

Patented "FLEXLOCK" Rubber Joints make a perfect and economical joint between two pieces of Chemical Stoneware Pipe. Equally satisfactory for vertical and horizontal drainage and fume duct lines.

"FLEXLOCK" Joints are the ONLY joints insuring all these advantages: **Positive seal**—No joint leaks. **Flexibility**—Takes care of expansion and building vibration. **Installation ease**—No other joints can be made so quickly. **Permanence**—No joint replacements. **Low installation cost**—Cheaper per laid foot than poured joints. **Unaffected by any fluid.** Even handles solvent hydrocarbons.

There is no other commercial product which is more universally resistant to acids, alkalis and corrosive chemicals and gases. Bromine, ferric chloride, sulphuric, sulphurous, nitric and hydrochloric acids of any concentration can all be handled with perfect safety.

The hubs are 4-in. deep and both the spigot and hub ends are deeply corrugated. Standard pipe lengths are 60 in. and are guaranteed straight and accurate.

Our line is complete, including elbows, bends, Y's, TY's, traps, crosses, sumps, floor drains, etc.

Cross-Section of "FLEXLOCK" Rubber Joint for Bell-and-Spigot Pipe

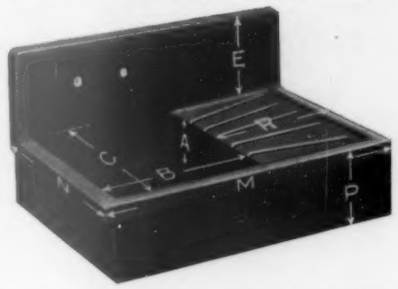
ACID-PROOF SINKS WITH INTEGRAL DRAINBOARDS

(One-piece)

Fig. 533-ASP (with Countersunk Outlet to take Metal Plug).

Fig. 533-BSP (with Integral Nipple Outlet and Removable Strainer).

Fig. 533-CSP (with Integral Nipple Outlet and Built-in Lute Trap).



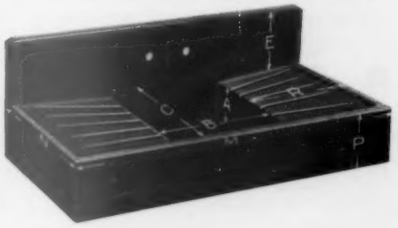
Size No.	B	C	A	E	M	N	P	R	Shipping Wt., Lbs.	Code Word	List Prices f. o. b. Factory Fig. 533-ASP	Fig. 533-BSP	Fig. 533-CSP
307	18	14	7	8	37½	16½	8⅞	18	197	Tong	$50.00	$61.00	$66.00
312	20	16	7	10	39¾	19	9⅛	18	285	Tope	52.00	63.00	68.00
313-A	24	18	8	10	43¾	21	10⅛	18	348	Tory	61.00	75.00	79.00
315	30	20	8	10	49¾	23	10⅛	18	410	Tuch	83.00	97.00	101.00

Above list prices are for sinks with drainboards at right hand or left hand. Special end table sinks can be made up with back cut out for trough drainage. Corner sinks with double integral backs and sinks without integral backs can also be supplied. *List prices subject to discount.*

Fig. 536-ASP (with Countersunk Outlet to take Metal Plug).

Fig. 536-BSP (with Integral Nipple Outlet and Removable Strainer).

Fig. 536-CSP (with Integral Nipple Outlet and Built-in Lute Trap).



Size No.	B	C	A	E	M	N	P	R	Shipping Wt., Lbs.	Code Word	List Prices f. o. b. Factory Fig. 536-ASP	Fig. 536-BSP	Fig. 536-CSP
507	18	14	7	8	54	16½	8⅞	18	284	Trew	$76.00	$91.00	$96.00
512	20	16	7	10	56	19	9⅛	18	402	Trig	78.00	93.00	98.00
513-A	24	18	8	10	60	21	10⅛	18	477	Trow	92.00	108.00	114.00
515	30	20	8	10	66	23	10⅛	18	546	Tude	125.00	141.00	145.00

Special end table sinks can be made up with back cut out for trough drainage. Corner sinks with double integral backs and sinks without integral backs can also be supplied. *List prices subject to discount.*

PACIFIC FOUNDRY COMPANY LTD.

551 Fifth Ave
New York

3100 Nineteenth St., San Francisco

1400 So. Alameda St.
Los Angeles

(AGENTS IN PRINCIPAL CITIES)

CORROSIRON

HIGH SILICON ACID RESISTING IRON

DRAIN PIPE AND FITTINGS

CORROSIRON is a high silicon iron alloy having a silicon content in excess of 14.25% unless otherwise specified. It is not a mixture or a formula, but a process developed under both metallurgical and foundry supervision including alloys prepared in the electric furnace.

It is a homogeneous alloy requiring neither treatment nor surface coating to obtain its excellent resistivity to corrosion and wear. CORROSIRON manufactured exclusively by the Pacific Foundry Company, Ltd.

From a corrosion standpoint, CORROSIRON gives exceedingly long life in contact with sulphuric, nitric and other acids and chemicals in commercial use and is used extensively for acid drain lines in Hospitals, Colleges, Universities, High Schools, Laboratories, etc.

Queens General Hospital
New York City

U. S. Mint
San Francisco, Calif.

Technical High School
New York City

U. S. Assay Office
New York City

These Schools, Colleges, Hospitals, Public and Private Buildings, "and many others, everywhere" specified acid-proof CORROSIRON drain pipe and fittings exclusively . . . because of its superior resistance to corrosion and wear

- **CORROSIRON** drain pipe and fittings dimensions are in accordance with those of standard extra heavy cast iron drain pipe; is readily installed and no unusual precautions need be taken excepting that lines should be secured and anchored closer than cast iron.

- **CORROSIRON** pipe is readily cut on the job using either special spring mounted pipe cutting tools or a cold chisel. Two or three turns round the pipe following a marked line with a cold chisel and light hammer blows will produce a clean break along the marked line.

  Joints are made as usual, using molten lead or lead wool and it is advisable to protect this lead from corrosion by packing the bottom of the bell with asbestos rope or Asbestos Wicking, which cannot be excelled for acid line service. Oakum or hemp are not satisfactory for acid lines.

- **CORROSIRON** has been manufactured and in satisfactory service for over 20 years proving its acceptability for acid and sanitary drains; has the approval of sanitary engineers of all the Federal, State and City authorities and conforms to building codes and requirements.

  We suggest the following form as a specification for use by architects and engineers:

SPECIFICATIONS

All acid proof drain pipe and fittings shall be ferro-silicon—CORROSIRON—or equal to comply with the following analysis:

All acid waste and acid vent piping shall be of approved high silicon cast iron bell and spigot type and shall contain:

"Not less than 14.25% and not more than 15% silicon.
Manganese below .50%.
Total carbon content below 1.12% and above .50%.
Sulphur below .05%.

"High silicon cast iron pipe and fittings for acid waste and acid vent pipe shall be of the thickness, etc., corresponding to extra heavy soil pipe and fittings unless otherwise approved."

BARNSTEAD STILL & STERILIZER CO., INC.

15 Lanesville Terrace, Forest Hills, Boston, Mass.

Original and Sole Manufacturers of "Barnstead Stills"

BARNSTEAD WATER STILLS

For more than sixty years Barnstead Water Stills have proved their ability to meet every laboratory requirement. They provide a distillate of unsurpassable purity. They are easy and economical to operate. And they are compact and attractive in appearance.

Such Barnstead features as preheating and venting that eliminate all volatile impurities; baffles that prevent evaporator impurities from contaminating the distillate; and low cost counter-current operation have made these stills the universal choice of not only leading colleges but of the foremost hospitals and industrial plants as well. All Barnstead Stills are made to go on the job and stay on the job. Construction is of copper and brass throughout. Linings are of pure block tin.

Furthermore, there is a Barnstead Still to meet every individual need. Sizes range from ½ to 500 gallons per hour. Mountings are for walls, tables, stands or concealment behind the wall. And operation is by gas, steam or electricity.

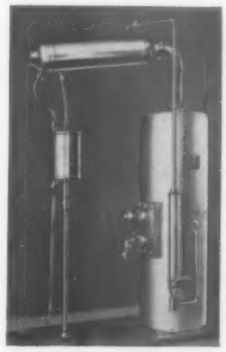
TO OVERCOME HARD WATER CONDITIONS

Distillation problems arising from excessively hard water can be easily overcome with Barnstead Extra Duty Type or Hard Water Stills. Contamination of the distillate by foaming and or priming is completely eliminated by an extra high evaporator casing. Concentration of dissolved or suspended impurities in the boiling water is kept down by a Barnstead Constant Bleeder Device, which bleeds boiling water from the evaporator at a constant rate. This greatly reduces the rate of scale formation and assures satisfactory operation.

All Barnstead Stills are easy to clean and this is of utmost importance in hard water districts. As an added feature of the Extra Duty Stills, steam-heated models with hourly capacities of 10 gallons or more are provided with a large handhole on the evaporator. The heating coil is mounted on the handhole cover so that the coil and the entire interior of the evaporator may be quickly exposed for thorough scale removal.

FOR ALL ROUTINE WORK

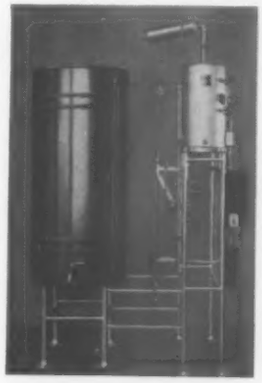
Barnstead Single Water Stills provide a distillate that will meet the demands of all routine laboratory work. It is chemically and bacteriologically pure and has shown under actual tests to have a conductivity as low as 1.5—2.0 x 10^{-6} reciprocal ohms.



Barnstead Single Stills are simple to operate and easy to clean. They require practically no attention. They come in all sizes. Are compact and finished in keeping with the finest laboratory appointments.

TO INSURE AN EVER-READY SUPPLY

With a Barnstead Full-Automatic-Controlled System you have ready at all times a chemically pure supply of distilled water sufficient to meet the most varied needs. These systems require absolutely no attention and are especially desirable where large quantities of distilled water are constantly needed.



They are equipped with a Storage Tank that automatically keeps filled between predetermined high and low levels at all times with distilled water. When the distilled water reaches the low mark in the tank the still automatically starts. When the tank becomes full the heat shuts off and the evaporator is automatically flushed. In electrically-heated systems, heating units are further protected by automatic cut-offs that prevent damage in case of water supply failure. In institutions where a number of departments use distilled water, the distillate can be piped by gravity from a central plant, thus obviating the need of a separate still for each department. All pipes are lined with pure block tin. Barnstead Full Automatic Systems are operated by gas, steam or electricity. They come in all sizes. Storage tanks, all sizes, come in copper and brass or wood. Lining is of pure block tin. Tanks may be equipped with sterilizers.

OTHER BARNSTEAD EQUIPMENT

Barnstead manufactures a full line of laboratory distilling equipment including conductivity stills, alcohol concentrators, solvent recovery stills, electric steam generators and Soxhlet extractors. Send for bulletins.

F. J. STOKES MACHINE COMPANY

Chemical Engineers and Process Equipment Manufacturers

5960 Tabor Road (Olney P. O.), Philadelphia, Pa.

REPRESENTATIVES: New York, Chicago, Cincinnati, St. Louis
Pacific Coast Representative: L. H. Butcher Co., Inc.

PRODUCTS

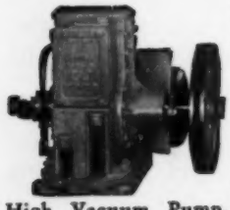
Water Stills	Evaporators	Kettles
Vacuum Shelf Dryers	Atmospheric Shelf Dryers	High Vacuum Pumps
Vacuum Rotary Dryers	Distilling Apparatus	Tablet Machines
	Mixers	

Stokes No. 171 One Gallon Automatic Water Still. Gas-heated model

WATER STILLS

For the economical production of distilled water of exceptionally high chemical and bacteriological purity for chemistry, biology and physics laboratories, Stokes Stills have a number of exclusive features which assure the high quality of the distillate as well as increase convenience of operation. 22 stock models, capacities ½ to 100 gals. per hour.

Typical is the No. 171 Still among the features of which are a Pyrex glass cover, triple vapor baffle, solid block-tin condenser tube, gas eliminator, deconcentrator (especially important in hard water districts) and, in the case of electrically-heated still, a patented dual-purpose safety device which protects the heating element. This still—of modern laboratory finish—is supplied steam, gas or electrically-heated with a wall bracket, though floor stand is available. It is easy to install and clean and operates automatically. 17,000 Stokes Stills in use. Write for literature and quotations.



High Vacuum Pump. Capacity 10 cu. ft. per min.

HIGH VACUUM PUMPS

Produce a vacuum within .01 mm. of absolute; quiet in operation, rugged and dependable. Self-contained, of the rotary oil-sealed plunger type, they are simple and compact. May be equipped with continuous oil clarifier. Arranged for motor drive. Sizes from 10 to 225 cu. ft. displacement stocked.

INSTALLATIONS

Among the colleges that have installed various types of Stokes standard and special equipment are:—Columbia University, University of Detroit, Phila. College of Pharmacy and Science, Oregon State College, Kansas State College, Tulane University of Louisiana, University of Pennsylvania, West Virginia University, Princeton University, University of Florida, Pennsylvania State College, Clarkson College, Chiao-Tung University, National University of Chekiang.

DRYERS

The No. 51 Laboratory Vacuum Shelf Dryer is very useful for vacuum drying or evaporating chemical, pharmaceutical, food and similar products sensitive to heat or oxidation, also for drying hygroscopic materials not readily dried in atmospheric ovens.

Stokes No. 51 Laboratory Vacuum Shelf Dryer

Design is ingenious and compact with condenser and receiver making up the stand for the vacuum chamber. The vacuum chamber is of special cast iron and contains two 18″ x 14″ shelves with 4″ clearance between them. Each dryer is self-contained and supplied complete with vacuum gauge, vacuum-break valve and either thermometer or steam pressure gauge.

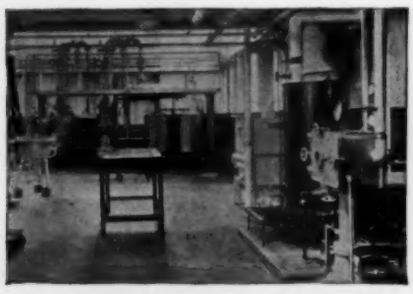
SPECIAL EQUIPMENT

For the development and expansion of your laboratory activities you may be considering special equipment, such as Vacuum Dryers, Vacuum Evaporators, Distilling Apparatus, etc., or standard apparatus, such as Water Stills, Dryers, Vacuum Pumps, etc.

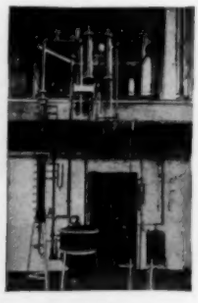
We have, in recent years, had the privilege of working with the directors of the Frick Laboratory at Princeton and the chemical engineering laboratories at the Universities of Pennsylvania, Tulane, Florida, Penn State College, University of Shanghai and others, both here and abroad.

Because of this special experience and our 40 years' service to both the laboratory and commercial fields, our engineers are able to cooperate in a most practical way in designing and building the type of apparatus you require . . . apparatus so designed that data may be obtained for the demonstration of basic principles in teaching or for research activities.

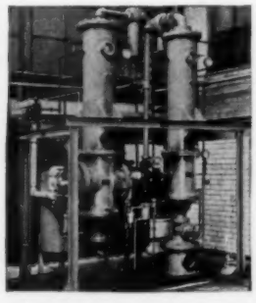
Specific suggestions and recommendations will be made if you will write us about your problems or requirements.



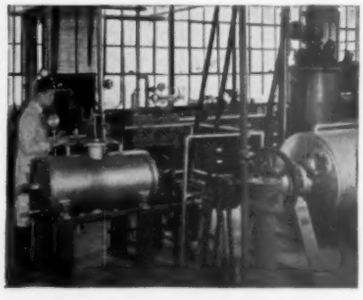
Installation view in Princeton chemical engineering laboratory. Note Double-effect Evaporator and No. 51 Vacuum Shelf Dryer. Fractional Distilling Apparatus not shown. Similar equipment installations in several university laboratories



Fractional Distilling Apparatus specially designed so that all engineering data can be obtained—as installed at several universities



Double-effect Evaporator in the laboratory of the University of Pennsylvania. Either effect can be operated independently. Second effect arranged for crystallizing



Section of Stokes process development laboratory; completely equipped with apparatus for experimental work, including vacuum still, pan dryer, rotary and shelf vacuum dryers, solvent recovery and extraction equipment and others

THE EATON-DIKEMAN COMPANY

Manufacturers of Filter Papers

Mount Holly Springs, Penna.

Laboratory Filter Paper for Schools, Colleges and Industries

For use in Funnels, Filter Presses and Filter Machines

Made with Spring Water

The Eaton-Dikeman Company was established in 1893 and is today the world's largest manufacturer of qualitative and industrial filter papers.

Forty diversified grades of uniform quality are made under strict laboratory control in a mountainous locality free from industrial aerial pollution.

Each grade was created to meet exact requirements of the liquid to be filtered.

The high standard quality of the E&D filter papers is acquired by the use of the best obtainable raw materials, from which our filter papers are made, under the careful supervision of laboratory experts. Analysis of the spring water used in making our filter papers shows it to be nearly as pure as distilled water. This assures you that the E&D filter papers are free from chemicals and salts that would be injurious to the filtered products.

ASK FOR THE E&D LABELS

Eaton-Dikeman Laboratory Papers are sold by all laboratory supply dealers under their own special labels as well as under the E&D labels. To be sure of getting E&D quality it is best to ask for the E&D label.

Some of the liquids filtered with E&D products are mineral and vegetable oils, varnishes, paints, all alcoholic and non-alcoholic beverages, sugar, perfumes, extracts, drugs, chemicals, soaps, glue, ink, fruit juices.

FILTER PAPER CLIPPINGS free from dust and grease are recommended to manufacturers of pharmaceutical, biological products in filtering machines, etc.

E&D BIBULOUS PAPER with good absorbent quality recommended for drying bacteriological slides, etc., supplied in sheets any size or books of fifty sheets 4″ x 6″ with advertising matter on covers.

E&D LINING PAPER, white or granite color, prevents glassware breakage and absorbs spilled liquids when placed in drawers and on shelves.

All grades of E&D qualitative filter papers in all sizes are now packed 100 circles in a box. We formerly packed only those sizes up to and including 8″ diameter in boxes. Our new method now provides all sizes packed in boxes to insure clean, perfect circles in all sizes when in use in the laboratory.

A fully equipped laboratory for making filtration tests is maintained for benefit of our customers.

PHYSICAL CHARACTERISTICS OF MOST POPULAR LABORATORY GRADES

Grade	Color	Surface	Texture	Rapidity cc. per Min.
607	White	Smooth	Med. Close	35-50
609	White	Smooth	Med. Close	30-45
612	White	Embossed	Med. Close	20-35
613	White	Smooth	Very Close	15-35
615	White	Creped	Fairly Open	75-150
617	White	Creped	Open	150-250
619	Gray	Creped	Fairly Open	75-150
620	Gray	Embossed	Fairly Close	45-70
629	White	Smooth	Med. Close	50-75

Note: Rapidity is number of cubic centimeters of distilled water filtered per minute in a 4″ 60° funnel.

E. I. DU PONT DE NEMOURS & COMPANY, INC.

GRASSELLI CHEMICALS DEPARTMENT

Wilmington, Delaware

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Represented in Canada by CANADIAN INDUSTRIES, LTD., General Chemicals Division, Montreal and Toronto

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C. P. NITRIC ACID

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C. P. AMMONIUM HYDROXIDE

C. P. GLACIAL ACETIC

In addition to the large number of Commercial Chemicals produced for industrial use, we have for years produced Chemically Pure Acids for laboratory work.

GRASSELLI Chemically Pure Acids are dependable and uniform. Analyses are shown on all labels.

Nation-wide branches and warehouses assure an excellence of delivery service in keeping with the High Quality of our C. P. products. Write for folder.

CONSTANT UNIFORMITY
STRICTLY CHEMICALLY PURE
ALWAYS DEPENDABLE

THE MATHESON COMPANY, INC.

331 Paterson Plank Road, East Rutherford, New Jersey

Compressed Gases, Reducing and Needle Valves and Controls

LECTURE BOTTLE

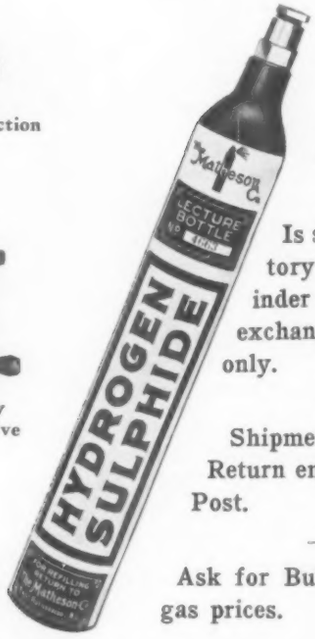
Size No. 5—2" x 12"

No. 34

Hose Connection
25¢

No. 31

Auxiliary
Needle Valve
$1.50



Reagent Gases

Is standard laboratory equipment. Cylinder returnable for exchange or refilling only.

Shipment by Express. Return empties by Parcel Post.

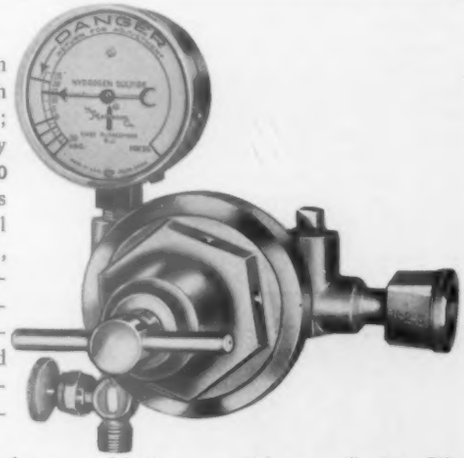
Ask for Bulletin No. 2 for gas prices.

May we add your name to our mailing list?

	NAME OF GASES	Cylndr. Bodies Alum. TOPS AS BELOW	Chem. Sign	Press. Per Sq. In. 70°F	Per Cent. Purity	No. 5—Lecture Bottle			
						Lbs.	Cu. Ft.	Price	Refill
1	AMMONIA (Anhy.)	Black	NH_3	114	99%	7 oz	(10)	$ 6.50	$1.50
2	ARGON	Green / Yellow	A	1400	99%	.....	2	12.50	7.50
3	BUTANE (C.P.)	White / Black	C_4H_{10}	25	99%	6 oz	(2)	7.50	2.50
4	BUTANE (Com.)	Black / Green	C_4H_{10}	25	97%	.....	.....	.....	.....
5	BUTYLENE	Yellow / Blue	C_4H_8	40		6 oz	(2)	7.50	2.50
6	CARBON DIOXIDE	Brown	CO_2	800	99%	½	(4)	6.00	1.00
7	CO_2 & OXY. MIX	Blue / Brown		1600			2	6.00	1.00
8	CHLORINE	Red	Cl_2	80	99.5%	1	(5)	6.50	1.50
9	ETHANE	Blue / Black	C_2H_6	700	95%	(4 oz)	4	6.50	1.50
10	ETHYL CHLORIDE	Red / Gray	C_2H_5Cl	35	99.5%	½	(3)	6.50	1.50
11	ETHYLENE	White	C_2H_4	1200	99%	4 oz	(3)	6.50	1.50
12	ETHYLENE OXIDE	Alumn / Red	C_2H_4O	25	99.9%	½	(3½)	7.00	2.00
13	FREON	Red / Yellow	CCl_2F_2	70		¾	(2)	6.50	1.50
14	HELIUM	Yellow / Black	He	1600	98%	.....	2	6.50	1.50
15	HYDROGEN	Yellow	H_2	1600	99.8%	.....	2	6.00	1.00
16	HYDROGEN SULFIDE	Gray	H_2S	300	99.9%	½	(6)	6.50	1.50
17	ISOBUTANE	Black / Yellow	C_4H_{10}	35	99%	6 oz	(2)	6.50	1.50
18	METHANE	Green / Black	CH_4	900	92%		1½	6.50	1.50
19	METHYL CHLORIDE	Red / Black	CH_3Cl	58	99%	½	(4)	6.50	1.50
20	NITROGEN	Pink	N_2	1600	99.7%	.....	2	6.00	1.00
21	NITROUS OXIDE	Alum. / Yellow	N_2O	800	98%	½	(4)	6.50	1.50
22	NICKEL CARBONYL	Red / Pink	$Ni(Co)_4$			Data on application			
23	OXYGEN	Blue	O_2	1600	99.8%	.....	2	6.00	1.00
24	PHOSGENE	Black / Blue	$COCl_2$	30	99.5%	¾	(4)	17.50	2.50
25	PROPANE (C.P.)	Black / Red	C_3H_8	115	99%	5 oz	(2)	7.50	2.50
26	PROPANE (Com.)	Brown / Black	C_3H_8	115	98%	.....	.....	.....	.....
27	PROPYLENE	Gray / Black	C_3H_6	130	95%	5 oz	(3)	7.50	2.50
28	SULFUR DIOXIDE	Green	SO_2	45	99.5%	1	(5)	6.50	1.50

HYDROGEN SULPHIDE GASOMETER

The safest instrument to store Hydrogen Sulphide in at a reduced pressure for laboratory use.



For Hydrogen Sulphide with special parts; no capacity gauge. $23.00

Forged brass body, nickel plated gauges, large metal diaphragm, has patented safety features. Is passed by the Underwriters Laboratories.

Recommended for use with Oxygen, Nitrogen, Carbon Dioxide, Hydrogen, etc. Price, $23.00

0 to 50 lbs. delivery pressure.

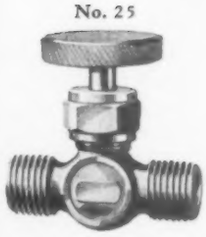
0 to 3000 lbs. tank pressure gauge.

For Ammonia with special gauges. $32.00

Ask for Bulletin XV

NEEDLE VALVES

No. 25



Matheson Valves of Forged Brass and Rod. For Gases, Water, Vacuum and Steam. Tested to hold 2000 lbs. pressure.

No. 28

No. 25 All Brass, ¼" I.P.S. Male thread. Price, $1.00

No. 27 Same as No. 25, but with small passage for fine flow. Price, $1.50

No. 28 All Brass, ⅛" I.P.S. Male thread. Price, $1.00

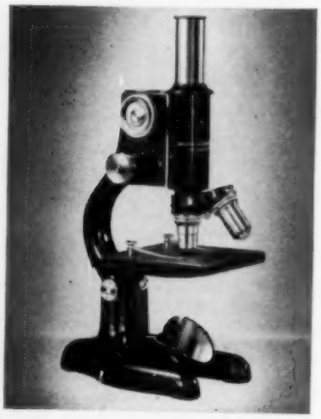
No. 30 Same as No. 28, but with small passage for fine flow. Price, $1.50

BAUSCH & LOMB OPTICAL COMPANY

655 St. Paul Street, Rochester, N. Y.

New York · Chicago · Boston · Los Angeles · San Francisco
London, England · Frankfurt A/M, Germany

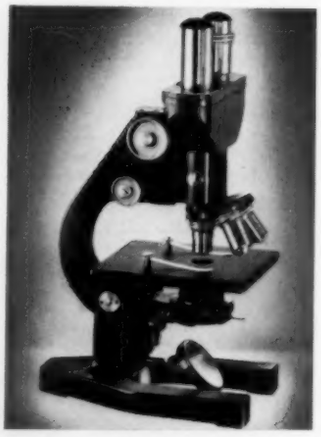
FB MICROSCOPE



Microscope FB is especially designed and built for elementary science work and its price, based on quantity production, is in line with the most restricted budget. It is ruggedly built to stand many years of hard class room usage. Its optics are of the same precision type that characterize the more expensive research type of instrument. Features include standard size, coarse and fine adjustments, double revolving nose piece, standard objectives and eyepieces, disc diaphragm, solid Bakelite stage, concave mirror, etc. Velvety black, wear resisting finish—Chromium plated parts.

Microscope F is similar to the instrument above but fine adjustment has been eliminated in the interests of economy. Magnifications range from 20 to 310 diameters.

HSE-8 MICROSCOPE



This splendidly designed and sturdily built microscope is especially adapted for advanced work in universities. Has vertical binocular body tube (interchangeable with monocular tube for photomicrography). The large stage (115 mm x 130 mm) is plain although any type of stage can readily be attached. The Abbe type condenser, 1.20 N.A., is in rack and pinion sub-stage. Huygenian type eyepieces and Achromatic objectives are of the finest grade optically. Oil immersion objective included. Other eyepieces and objectives for various purposes are available. Inclined binocular body tube is recommended for greatest comfort in extended observations.

K TYPE BINOCULAR MICROSCOPE

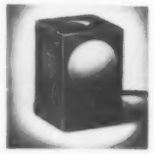
The great popularity of the K Type Binocular Microscope has prompted us to offer the Model "K," for schools and universities. Its range of magnifications of from 7X to 150X especially suit it for biological, bacteriological and paleontological work. An interesting feature of this series is the new dustproof Shuttle nosepiece, specially made for this series. This microscope gives stereoscopic, three dimensional effect. Image is upright and unreversed. Exceptionally wide field.

MICROSCOPE TABLE LAMP

This Table Lamp can be used to illuminate several microscopes at once. It is invaluable in class room work where groups of students are making observations at the same time.

Equipped with daylight blue globe, this lamp represents the finest source of artificial daylight for the microscope, approximating noon sun light.

OTHER MICROSCOPE LAMPS



Other B & L Microscope Lamps are available for various purposes in the school laboratory. The two shown herewith are (right) a substage lamp and (left) the Universal Microscope Lamp.

B & L MICROTOMES

The B & L line of Microtomes is most complete. The Minot Automatic Rotary Microtome illustrated is ideal for rapid serial sectioning, cutting section with accuracy down to 1 micron in thickness. Feeding mechanism operates automatically. Dustproof operating mechanism. Catalog D-21 describes the complete line, including the new Precision Automatic Microtome—motor driven.

B & L SPECTROGRAPHS

The complete B & L line of Spectrographic Equipment covers every need. Models range from the Bunsen Spectroscope for elementary class room work to the large Littrow Spectrograph for examining complex alloys. Each is designed and built with the utmost care and due to our great experience in this field represents all of the best features necessary for both teaching and laboratory research. Catalogs D-221 and D-20 give complete details.

QR MAGNIFIER

This is an adjustable tripod type magnifier which is placed directly over the specimen. Has double lens, magnifying 7.5X. Useful for the school laboratory. Other magnifiers for various purposes are available.

SEND FOR CATALOGS

For complete information on Laboratory Microscopes send for Catalog D-185. For information on B & L Balopticons see page 376 this catalog. Remember the instruments listed on these pages are but a small part of the B & L Line. If you have need for information on any optical products whatsoever, Bausch & Lomb will gladly be of service to you.

SPENCER LENS COMPANY

Buffalo, New York

Manufacturers of

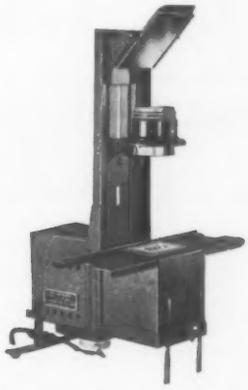
Microscopes—Microtomes—Optical Measuring Instruments
Delineascopes—Photomicrographic Cameras

BRANCH OFFICES

New York . . . Chicago . . . Washington . . . Boston . . . San Francisco . . . Los Angeles . . . Dallas . . . Columbus

COMBINATION CLASSROOM DELINEASCOPE Model VA

This Delineascope projects both lantern slides and opaque objects, the change from one to the other being made quickly by the turn of a handle. It projects postcards, photographs, drawings, pages in books, mineral and biological specimens. The back of the instrument is open so that illustrations in books of large size may be projected. An improved elevating device facilitates centering the picture on the screen. Furnished with or without cooling fan. A filmslide attachment may be added.



LECTURE TABLE DELINEASCOPE

Spencer Model B is designed for lecture table use and projects glass slides, materials in Petrie dishes or other transparent objects during all or any part of a lecture. The slide is placed on the horizontal platform and is readable to the lecturer.

The action of drawing or writing with a pencil on a ground glass slide can be projected. The shadow of any small, pointed object is projected as a pointer on the screen which is above and behind the lecturer.

FILM SLIDE DELINEASCOPE

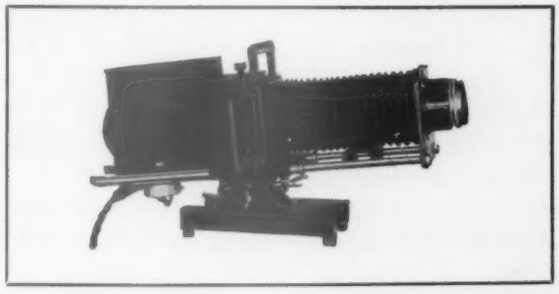
Model I-T Delineascope equipped with 200 watt lamp and having an unusually efficient optical system, projects filmslides with maximum illumination and definition. Compact, sturdy construction. A pressure plate release and recessed film track assures long film life. The special elevating device is positive in action to prevent the machine dropping back after correct screen height is secured. The spreading front legs insure stability and are geared to swing out into position with one movement. Easy to focus and simple to operate.

COLOR PLATE DELINEASCOPE

Spencer Model DK was designed especially for projecting natural color plates and other valuable slides.

A cooling fan protects color slides from heat and permits maximum illumination without altering color values.

Model DK accommodates color plates from 2″ x 2″ to 3¼″ x 4¼″. A larger size, for auditorium use, accommodates color plates up to 9 cm. x 12 cm.



CLASSROOM DELINEASCOPE

Spencer Model D, for the projection of glass slides in classroom work, embodies several special features for the convenience of the teacher. It has a non-heat conducting carrying handle; a tilting and elevating device for conveniently locating the picture on the screen; an aperture in the side of the lamphouse to illuminate manuscripts; special optical system to insure remarkably sharp, brilliant pictures. Sturdy, lightweight and extremely portable.

WRITE DEPT. 13A FOR COMPLETE DETAILS ON SPENCER DELINEASCOPES

SEE PAGE 577
FOR MICROSCOPES

SECTION XI
SHOP PLANNING AND EQUIPMENT

BUILDINGS FOR TRADE SCHOOLS

Layout, Construction Features, and Equipment

By A. S. BOYNTON

Director of the Bureau of Vocational Education, Connecticut State Department of Education

TO the director of a program of vocational education there will always come the problem of planning a suitable building to house the program. Sometimes this is a prerequisite to the establishment of the program, but more often the program has been established and has operated for several years in any available building, and, having sold itself to the community and far outgrown the old quarters, it demands a new building.

For the average director of vocational education, securing new buildings means that much effort must be expended by many people, and it is therefore not as simple a procedure as merely handing the proposition over to an architect. To "sell" the idea, the director must have in his own mind the type of building required, and certainly a good idea of its cost.

In order to determine the type of building and its floor layout, several things should be clear at the outset; namely:

(1) What vocational education is;

(2) What trades should be taught for the given community or area;

(3) How many students will apply for training;

(4) How many students the building should accommodate.

The answer to item (4) may be quite different from the answer to item (3), as will appear later, and of course the size and cost of the building will vary accordingly.

The bulletins on vocational education of the U. S. Office of Education define vocational education as a type of training for useful employment, given to persons who are thereby prepared to enter or advance in a chosen vocation as trained workers and wage-earners.

From this definition, the following factors which influence the type of building can be assumed:

(1) That the building shall be of a practical style found most efficient in the industries for which the students are being prepared.

(2) That the hours of attendance of students shall conform nearly to the work hours of industry. At present this means that the vocational school should operate on a 40-hour week.

(3) That the methods of shop instruction shall follow the routine operations and incentives of industry. This means that the shops should be on a productive basis.

(4) That the classroom theory taught for any trade shall be the type of instruction material that will function in the manipulative processes of that trade as taught in the shops. This means that one-third of the whole time will be required to be given over to classroom trade related theory, leaving two-thirds to the practical manipulative processes of the trade for which the pupil is preparing.

Trades to Be Taught

Concerning the trades to be taught in the building, the vocational director must, through investigation, discover what occupations offer reasonable placement opportunities for the graduates of the courses. This should be the limiting factor to determine the maximum number to be enrolled in each department, allowing of course for drop-outs before graduation. Often, the number applying for enrolment in trade training courses is many times the number that could possibly be placed.

To determine the placement opportunities, contact should be made with employers and labor officials, and their cooperation should be obtained through committees or other means, so that fair and accurate estimates of the need for training can be secured. This type of survey, then, will answer the question as

to what trade courses are to be offered and also the number of students that the new building must accommodate.

Knowing the number proposed to be registered in the school as learning a particular trade, the number to be in average attendance in any trade shop should be two-thirds of the number registered for that trade, since one-third of those registered are to be absent from that shop and in the classrooms.

Floor Area Needed

The question of floor area, especially in the shops, can be found from the amount of space allowable to each individual in shop attendance. These floor allotments are the result of a study of an average of several shops of each type and have been found to give a very fair estimate of space required for a trade school working on a production basis. If the exact trade desired does not appear in the table of allotments, other trades with similar activities can be selected from the table, and the allotment of the latter used in the estimate. No space is allowed in the shops for the amphitheater of chairs, sometimes seen in so-called trade schools. The floor allotments per pupil are given below:

Trade	Square Feet per Pupil
Machine shop	75
Carpentry	150
Electrical	100
Foundry	90
Masonry	175
Painting and decorating	130
Plumbing and steamfitting	125
Printing	100
Wood patternmaking	120
Automobile repair	165
Classrooms (math., etc.)	100
Commercial sewing	100
Beauty culture	70
Auditorium (includes stage and anteroom)	14
Other Required Space per Pupil of Total Enrolment	
Heating plant	4
Director's and general office	2
Corridors and stairways	20
Lavatories and locker rooms	10
Miscellaneous	2

Using the average attendance in each shop or classroom and multiplying by the per-pupil footage, the total floor area necessary can be estimated.

The Estimated Cubic-Foot Cost

To obtain a final estimated cost of building, find the cubical contents by multiplying by the ceiling height, which may vary in different localities. In the writer's experience, 12 feet, 6 inches is the average, with 22 feet for auditoriums and gymnasiums.

The cubic-foot cost will vary according to the ideas of various people as to what constitutes necessary or desirable decoration in a trade-school building. For a dignified industrial type, steel with brick or concrete, fireproof construction, proper for a real trade school, a cost of 30 to 35 cents per cubic foot of contents should give a suitable building. Some have been built for under 30 cents, but are not advisable.

The foregoing suggests the process the vocational director should go through to get an idea of the approximate final cost of a building. This plan is given in some detail, since it is often necessary to have some fairly accurate idea of final cost in order to secure the financing of the proposed building, even before the architect gets the order to draw up the building.

With this first "selling" process successfully concluded, the location, general shape, number of floors and arrangement of departments must be decided.

Location, Shape, of Building

It is usually found convenient to locate the building on sloping ground, which brings the second floor also on ground level and enables freight deliveries to be made there as easily as on the first floor.

Much attention should be given to the matter of locating the building in a district where it will be convenient of access for those attending. Evening school should be given important consideration on this point, since if practical instruction is given and the instructors are all selected from tradesmen with satisfactory trade experience, at least fifteen years, then the evening enrolment should at least equal the day enrolment, and those enrolling will be already working in industry.

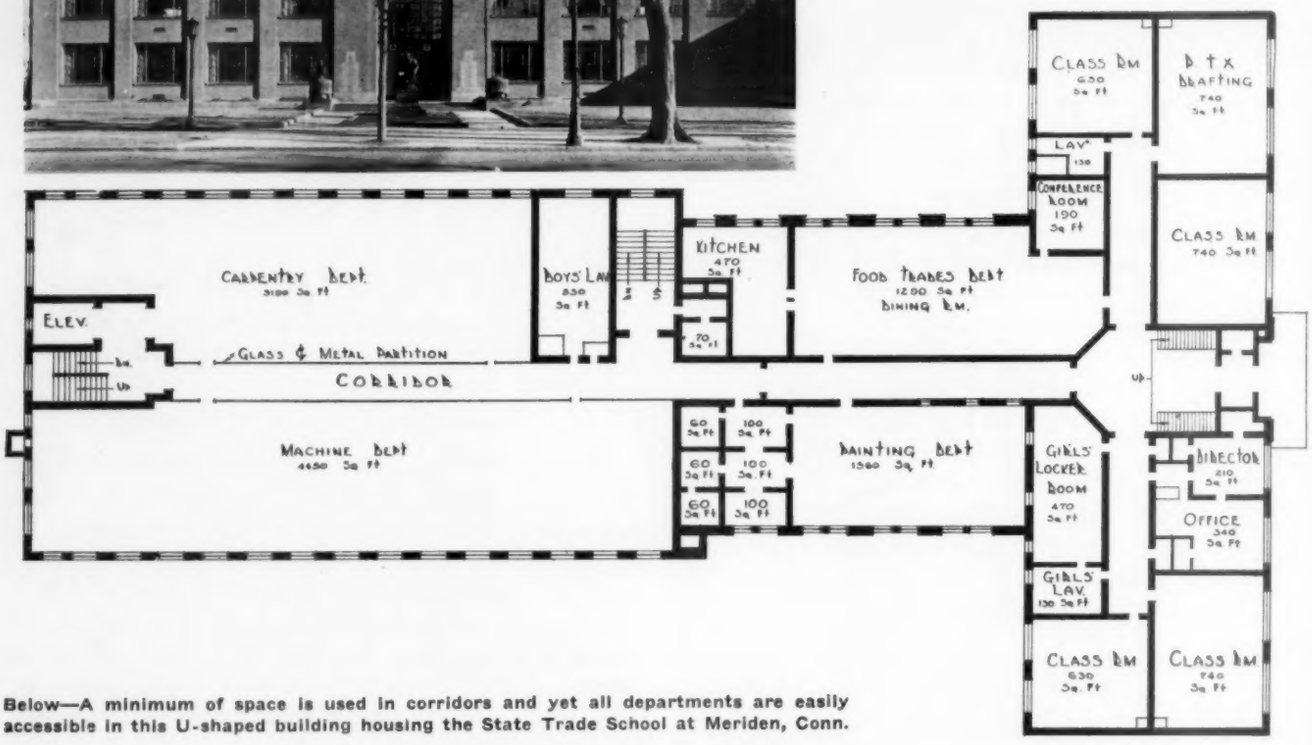
In order that the architect may be fully informed as to the requirements of those who are to use the building, a sketch should be furnished him, showing the shape of the building with the location of the various shops, classrooms, offices, etc., with dimensions of each. This may be in the form of a scale diagram. It is then the architect's work to design the structural details conforming to building codes and fire laws and having a dignified and pleasing appearance.

Number, Arrangement, of Floors

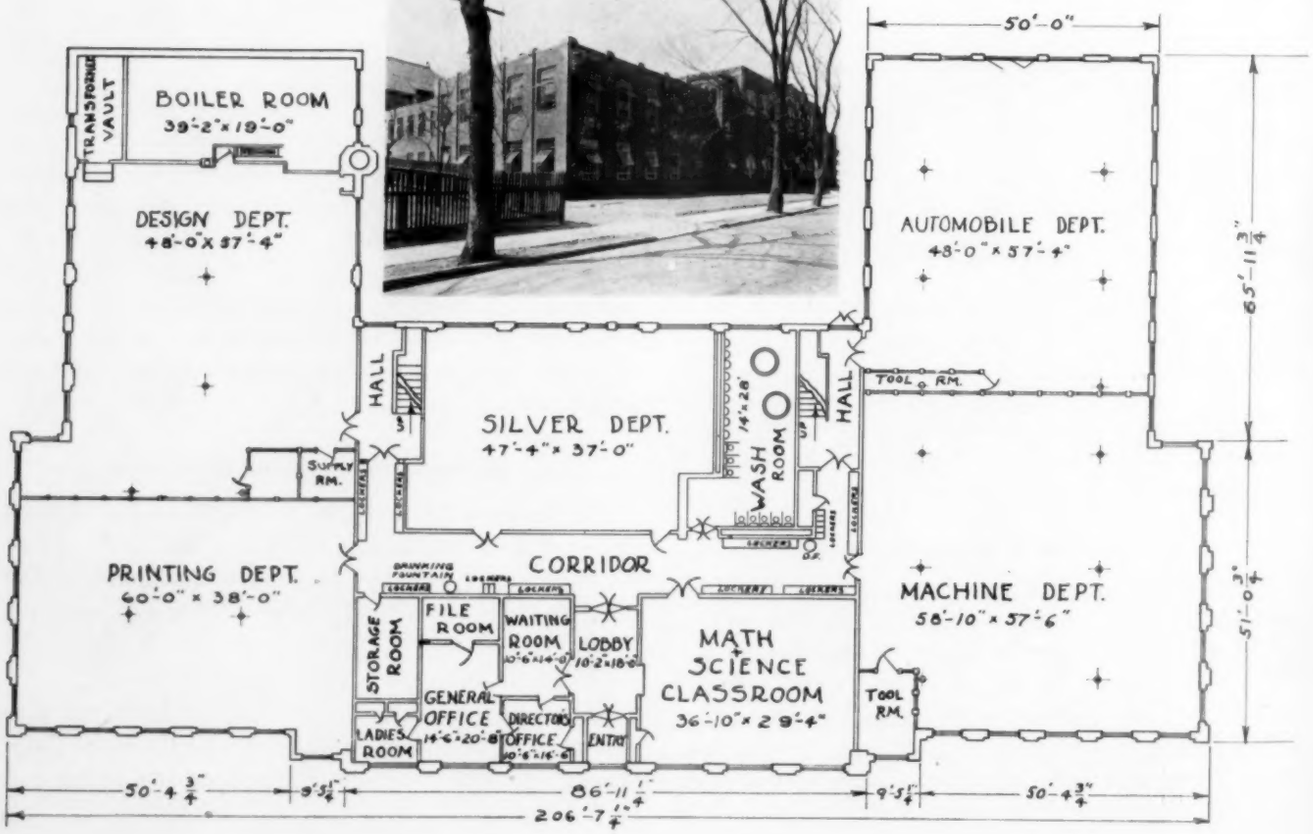
The number of floors in the building will depend on several factors, among which are: the total amount of floor area necessary; the size of the building lot; and the value of the land. In general, more than three floors is undesirable, better two; but in cities, the cost of real estate makes more floors necessary.

The usual E-, L-, U-, or T-shape buildings give wings 45 or 50 feet in width, and with the large shops located in these wings, corridor space can be kept at a minimum.

The first-floor plan of the State Trade School at Hartford, Conn., shows how a T-shaped building may be laid out



Below—A minimum of space is used in corridors and yet all departments are easily accessible in this U-shaped building housing the State Trade School at Meriden, Conn.



As a typical example of the U-shaped building, the first-floor plan of the State Trade School at Meriden, Conn., is shown. A minimum of the total available space is used in corridors in this plan, and yet all departments are easily accessible.

The first-floor plan of the State Trade School at Hartford, Conn., illustrates the T-shaped building. A larger percentage of the total space is used in the corridors in a building of this shape than in the U-shape. Varying conditions justify the different types.

The interior partitions should, as far as possible, be steel, either solid or steel below and glass above. This type of partition is flexible and will take care of future changes as teaching requirements may develop.

In planning the interior arrangement, the people who are to use the building should be consulted in detail as to their ideas and desires. This statement applies, of course, where the new building is a replacement of an existing structure, and some part of the operating staff is already employed.

Room Width, Height, Outside Light

One of the chief requirements which should be carefully watched is the matter of light. In general, the glass area in each department should be not less than 20 per cent of the floor area. Many industrial establishments run much higher in this respect, and numbers of them have around 30 per cent. In addition, the rooms should not be wider than four times the height from the floor to the top of the windows where light comes from both sides, or twice the window height for unilateral lighting. Hence, for rooms of 12 feet, 6 inches ceiling, the maximum width of room is about 45 feet when light comes from both sides, or 22 feet, 6 inches for the unilateral. This will probably work out well with shops having light from both sides and classrooms with unilateral lighting.

Equipment and Its Installation

As soon as actual ideas for the building are well worked out and the final construction assured, definite plans should be made for the kind, type, and location of the equipment in the various departments. The type and kind can be determined through consultation with employers in the placement fields of the schools. The equipment should be similar to that which those trained at the school are expected to operate at their wage-earning employment. Surveys should be made of industries within the area from which the school draws its pupils, and lists made of equipment used, including manufacturer's name, size, and method of operating. Types of machinery not found in industries should not be used in the trade school. The school will probably find that it has all it can do to keep its equipment up to the level maintained by industry without attempting to show the way.

In the actual process of locating the equipment in the various departments, the instructors in charge should play an important part. All equipment should be located on scale drawings before any is fastened down to the floor.

With the completion of the building and the installation of equipment, the school is ready for its pupils. From this point on, its success depends to a great measure on the trade experience and energy of the instructors and the practical nature of the instruction, all guided by an efficient school administrator.

THE IMPORTANCE OF PROPER SELECTION OF EQUIPMENT FOR VOCATIONAL SCHOOL SHOPS

By H. GILES MARTIN

Director, Isaac Delgado Central Trades School, New Orleans, La.

THE problem of selecting equipment for an industrial school is so interlocked with the other managerial problems, that advice cannot be reduced to as simple and concise a statement as one might wish. It is therefore preferable that we set up the major factors of the problem, discuss each one separately, and leave to the local designer, or adviser, the task of applying these considerations to his local community.

Major Factors to Be Weighed

Some of the factors to consider follow:

The student load to be served by the initial equipment.

The intensity of instruction—whether fully industrial or pre-vocational.

Funds available for the initial installation.

Funds available annually for maintenance, replacement, and modernization.

Funds available annually for additions to equipment to meet increased enrolments.

The funds available for an initial installation of equipment are seldom unlimited, or even a generous portion of the total funding of the institution. It is therefore necessary to take into joint consideration the initial enrolment and the teaching objectives.

We should first determine the number of periods of time to be allotted to the shop courses, the resultant number of groups, and the maximum enrolment necessary in each.

Determining the Maximum Enrolment

The maximum number of students for any one group, for effective and efficient instruction, will vary somewhat with the different trades, but should range between 16 and 24 per teacher, at any one time. This is often a point of dispute between the vocational teachers and a purely academic superintendent. However, superintendents of broad experience have given this point considerable thought and agree that trade instruction comes under laboratory considerations.

At this point the superintendent must make the decision as to the number of shop instructors his budget allows, and the resultant student enrolment and program. This in turn will determine the maximum number of first-, second-, third- and possibly fourth-year students in any shop at one time.

The industrial teacher, or supervisor, may then set up his proposal for general and group equipment.

It would be advisable for the superintendent, or supervisor, before going further, to hold informal conferences with the industrial groups of the community, keeping in mind the fact that members of these groups, while very practical in their business, are as a rule not familiar with educational problems and methods.

However, if a superintendent, or supervisor, sets up in these conferences the educational features of his plan, he should be able to get very valuable reactions with friendly suggestions and criticisms before going too deeply into the next step of his plan, or the final selection of equipment.

After working out that tentative schedule, it may be necessary for him to make a counter-proposal to the superintendent as to the maximum enrolment, suggesting a more comprehensive or a reduced plan, as best calculated to ensure the full and efficient use of the investment in tools and machines.

Setting Up Equipment Lists

We should list the type and number of group tools, such as grinders, planers, power saw, etc., necessary for the size classes of the initial enrolment.

We should next list the individual tools and determine the number required to furnish each trainee with a set, which is of course the best practice and economy over a period of years. Doubling, or tripling, assignments results in rapid deterioration and should be resorted to only because of extreme conditions. The total enrolment in the shop courses will give the number of individual tool sets to be provided; each of course for the trade for which enrolled.

There are, of course, a number of tools that are used only periodically, and these should be listed with the group tools and machines.

A number of these "set-ups" appear on the following pages, showing the principal items of equipment and tools, and the number of students that can be accommodated.

A CARPENTRY AND MILL WORK SET-UP

Shop area—9,000 square feet
Two instructors; one toolkeeper janitor
16 first-year students
12 second-year students
12 third-year students

General Shop Equipment:

1 Universal saw; 45″ table; 14″ saws, motor-driven
1 36″ band-saw, motor-driven
1 20″ safety head jointer, motor-driven
1 26″ double surfacer, motor-driven
1 wet emery grinder, motor-driven
1 woodworking lathe, motor-driven
1 mortiser, ¼″ to ¾″ x 3″ x 12″, motor-driven
1 tenoner, 3″ x 20″
1 saw-filing machine
1 gas, or electric, glue-pot
28 individual benches equipped with carpenters' vises
2 special benches equipped with cabinet makers' vises
1 shavings exhaust system

Periodically Used Tools:

1 builder's transit and rod
1 100-foot tape
1 portable sander
1 portable drill
1 portable blower
Levels, plumb-bobs, special saws, screw-drivers, etc., issued by toolkeeper as needed

Individual Tool Sets:

Assigned to each student for his use and for training in the care and conditioning of tools.
1 6″ try-square
1 10″ bevel-square
1 24″ framing-square
1 8″ smoothing-plane
1 6″ block-plane
1 15″ jack-plane
1 18″ fore-plane
1 whisk-broom
1 counter sink
1 scratch-gage
1 carpenter's pincers
1 6″ wing dividers
1 12″ wing dividers
1 26″ 5-point, rip-saw
1 26″ 10-point, cross-cut saw
1 ratchet brace
1 set of auger bits
2 brace screw-driver bits
1 8″ screw-driver
1 India oil stone
1 knife
1 bench oiler
1 mallet
1 set of framing chisels
1 adze-eye nail hammer

PLUMBING SET-UP

Floor area—5,000 square feet; shop and lecture room
Two instructors; one toolkeeper janitor
20 first-year students
12 second-year students
10 third-year students

General Shop Equipment:

1 pipe-cutting and threading machine, 1″ to 6″ capacity, stationary, direct motor-driven
1 heavy-duty dry emery grinder, motor-driven
4 heavy steel-plate tables, 4″ x 12″, with three stationary melting pots each
2 10′ wood benches with pipe vises
1 10′ heavy hardwood top table for lead beating
1 portable power-driven stock and die tool
1 portable power-driven unit

Periodically Used Tools:

1 builders' transit and rod
5 Plumbers' Friends
1 test plug
5 gasoline furnaces
1 force pump
30 solder-pots
10 pipe-cutters
Pipe taps
5 ratchet boring tools
5 sets stocks and dies ratchet, ⅛″ to 1″
5 sets Armstrong stocks and dies, ⅛″ to 1″
20 mallets
30 lead and solder-pots
2 cross-cut saws
2 rip-saws
10 inside calipers, 10″
10 outside calipers, 10″
10 dividers, 8″
5 bib and valve reseaters
2 steel squares
5 sets assorted-size twist drills
30 solder-pans
1 water-main taping machine
2 sledge-hammers
5 sewer cables
2 bench-type pipe benders
1 suction pump
1 electric hand drill
5 24″ levels
1 force cup
1 toilet auger
5 blow-torches
2 chain pipe tongs
20 pipe wrenches
5 pipe burring reamers
10 sets Toledo stocks and dies, 1″ to 2″

Individual Tool Sets:

Assigned to each student for use and for training in the care and conditioning of tools.
1 screw-driver
1 ball peen-hammer
1 compass-saw
1 cold chisel
1 cape chisel
1 inside calking iron
1 packing iron
1 hacksaw frame and blades
1 spring yawning iron
1 tap borer
1 combination pliers
1 plumb-bob
1 lead dresser
1 pouring ladle
1 bit-brace
1 basin-wrench
1 breast-drill
1 joint runner
1 pair soldering coppers, 2-pound
1 file
1 rasp
4 wood chisels
1 outside calking iron
1 drift plug
1 bending iron
1 shave hook
1 pair wing dividers
1 wiping cloth
1 turn-pin
1 bossing-stick
1 strap-wrench
1 speed-wrench
2 pipe wrenches
2 monkey-wrenches

BRICKLAYING SET-UP

Inside floor area of 3,000 square feet
Outside ground area of 3,000 square feet
One instructor and one laborer
12 first-year students
10 second-year students
8 third-year students

General Equipment:

Mortar mixing-box
Heavy-duty emery grinder, gasoline-driven
Detail drawing-table
Cement mixing-machine, gasoline-driven

Periodically Used Tools:

1 builders' transit, rod and tape
1 saw
1 16′ 0″ straight-edge
1 100′ steel tape
1 hatchet
1 maul
1 ax
1 complete set of stone cutters' tools

Individual Tool Sets:

Assigned to each student for his use and for training in care and conditioning of tools.
1 brickmason's 10″ trowel
1 brickmason's 1¼-lb. hammer
1 brickmason's 4″ set
1 brickmason's 18″ level
1 brickmason's 8″ divider
1 brickmason's roundsunk jointer
1 brickmason's rakeout jointer
1 brickmason's line-pin
1 brickmason's 4½″ pointing trowel
1 brickmason's 1¼-lb. scutch
1 brickmason's 4′ level
1 brickmason's 8 x 10 square
1 brickmason's counter brush
1 brickmason's V jointer
1 brickmason's slicker
1 tool-bag

HOUSE PAINTING, FRESCO PAINTING AND INTERIOR DECORATING

Floor area—4,000 to 5,000 square feet, divided into rooms with easily changed architectural details
One instructor and one toolkeeper janitor
10 first-year students
8 second-year students
6 to 8 third-year students

General Equipment and Periodically Used Tools:

One of the most important items of equipment in this trade is scaffolding. Sectional ladder scaffolding has been perfected to the point where the school can be assured of safety during practice and instruction, in high places, as well as speed and low cost in erecting and moving.

A sufficient number of units of sufficient variety should be provided to meet a ceiling project 20′ x 40′ x 24′ in height, and for a wall project of the same height by 40′ in length.

12 14′ and 16′ step-ladders
2 40′ house painters' extension ladders
2 French type step-ladders, 10′ with 8′ extension
1 painters' stage with safety rails
A stock of carefully selected scaffold flooring
1 paper hangers' table
1 paint grinder, motor-driven
1 stationary air compressor and regulator
1 portable spray-gun set
1 large glue-pot for glue for making molds for reproducing plaster pieces
2 painters' blow-torches
1 set of paper hangers' tools
10 stippling brushes, 3¾″ x 9″

Individual Tool Sets:

Assigned to each student for use and for training in the care and conditioning of tools.
1 putty-knife
1 sash tool
1 stucco or wall brush
1 scraper
1 varnish brush
1 duster

A CABINET MAKER SCHOOL SHOP SET-UP

Floor area—7,800 square feet
Two instructors; one toolkeeper janitor
20 first-year students
16 second-year students
12 third-year students

General Shop Tools and Machines:

1 26″ double surfacer, full motor-driven
1 20″ safety head jointer, motor-driven
1 band-saw, motor-driven, 36″ x 18″
1 jig-saw, motor-driven
1 two-spindle shaper, motor-driven
1 Universal saw, motor-driven; 45″ table; 14″ saws
1 tenoning machine, motor-driven, 3″ x 20″
1 mortiser, motor-driven, size ¼″ to ¾″ x 3″ x 12″
1 four-side molder, motor-driven, 6″ x 3″
5 wood-turning lathes, belt- or motor-driven
1 pattern makers' lathe, motor-driven
1 wet grinder, motor-driven
1 drum sander, 42″
1 disc and spindle sander, motor-driven
1 saw-filing machine, motor-driven
1 Universal knife grinder, 30″, motor-driven
1 knife balancer
48 individual benches, equipped with cabinet makers' vises
4 electric or gas glue-pots
1 veneer press, 48″ x 96″
Complete shavings exhaust system

Periodically Used Tools:

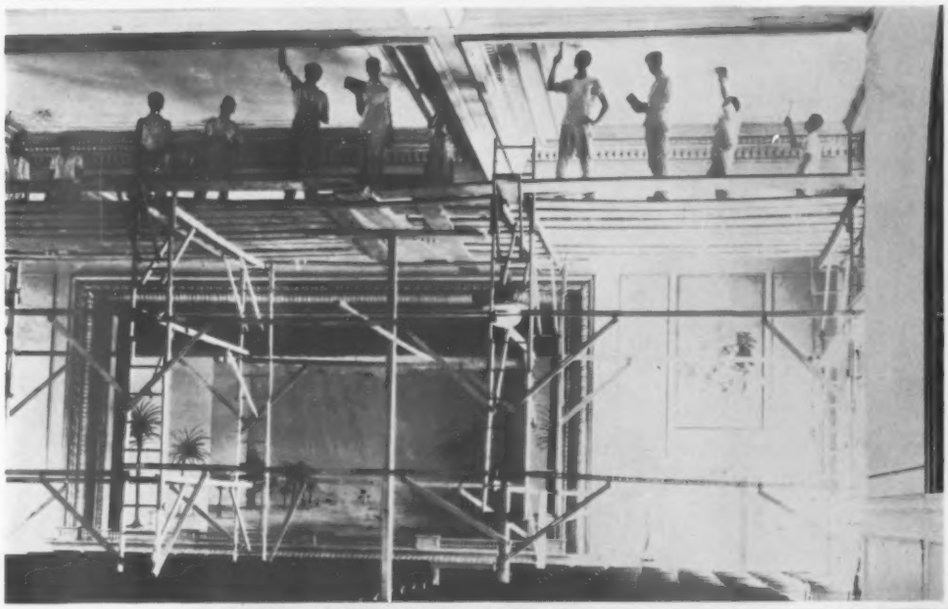
1 power blower
1 portable router
1 portable sander

Individual Tool Sets:

Assigned to each student for his use and for training in the care and conditioning of tools.
1 22″ jointer
1 15″ jack-plane
1 smooth-plane
1 block-plane
1 10-point cross-cut saw, 24″ long, ship point
1 rip-saw, 5½-point, 24″ long, ship point
1 16-oz. claw-hammer
1 brace
1 ⅜″ bit
1 5/16″ gimlet
1 wood mallet, 3″ x 5″
3 wood chisels, 1″, ½″ and ¼″
1 8″ regular screw-driver
1 3″ regular screw-driver
1 2″ x 7″ combination India oil stone
1 10″ bevel square, #18
1 8″ try-square, #12
1 marking gage
1 file-cleaner
1 10″ ½-round cabinet rasp
1 10″ ½-round cabinet file
1 cabinet scraper, #80
1 hand scraper, 3″ x 5″
1 8″ double-point dividers
1 8″ carpenter's pincer
1 bench oil-can
1 bit gage
1 counter duster

Left—Bricklaying students constructing addition to the present Trade School building

Below—Interior decorating classes use practical equipment on many practical projects



Students at work in a small section of the cabinet-making department

A MACHINE SHOP SET-UP

Floor area—7,900 square feet
Three shop instructors; one toolkeeper janitor
30 first-year students
18 second-year students
16 third-year students

Group Tools or Machines:

2 planers—24″ x 6′ 0″ individual motor- or belt-driven
3 Universal milling machines—number two single pulley drive
2 horizontal shapers—16″ belt-driven
8 lathes 14″ x 6′ 0″ each of different makes and advanced types
10 lathes of any one of above make, belt-drive, modern change gear
1 vertical boring mill, 36″, motor-driven
1 radial drill, motor-driven
2 drill press (geared), 20″, belt-driven
2 sensitive drills, 14″, belt-driven
1 Universal grinder, 12″ x 36″, belt- or motor-driven
1 wet tool grinder, 14″, belt-driven
1 double dry emery grinder, 14″, belt-driven
1 power hack-saw, 16″, belt- or motor-driven
1 gas or coal forge
1 oxy-acetylene cutting and welding set
1 Arbor press, large
1 Arbor press, small
2 gas (or oil) heat treatment furnaces, 6″ x 10″ x 15″
2 anvils 150-lb.
30 heavy vises
180 feet of bench (continuous or unit)
Motors, line shafting, and belting

Periodically Used Tools:

Lathe, plane and shaper tools; milling cuttings; drills; taps and dies; calipers; steel rules; combination squares and gages; wrenches; heavy hammers and special hammers; forge tools.

Individual Tool Sets:

1 ball peen-hammer
1 flat chisel
1 cope chisel
2 files
Set of scrapers (these to be ground and cared for by students)
Safety and welding goggles

AN ELECTRICAL SHOP SET-UP

Floor area—9,000 square feet
Four instructors; one toolkeeper janitor
44 first-year students
24 second-year students
24 third-year students

General Shop Equipment:

The general shop equipment for an electrical course will vary considerably in different localities. Therefore, the following list is only a suggestion based upon the set-up in a particular school.

2 machine lathes 14″ x 6′ 0″
2 sensitive drills, belt-driven
1 drill press, back-geared, 20″, belt-driven
1 double emery grinder, belt-driven
1 conduit-bender
2 coil-winding machines, for armature and field coils
2 adjustable coil spreaders
2 magnet wire racks for winding machines
1 motor test switchboard
12 medium machine vises
2 motor generator sets for testing
200 feet of heavy benches, continuous or unit
12 stationary soldering furnaces
1 coil baking oven

Periodically Used Tools:

Portable ammeters and voltmeters, the number to be determined by the ability of the instructional staff to make quick repairs. Pipe-cutting tools, pipe taps and dies; machine taps and dies; drills and reamers; lead-burning torches; gasoline and alcohol torches.

Individual Tool Sets:

Assigned to each student for his use and for training in the care and conditioning of tools.

1 automatic drill
4 wood bits 5, 6, 8, 16, 18
1 pair combination snips
1 bit-brace
1 hack-saw frame
1 6″ Wescott wrench
1 claw-hammer
1 wire gage
1 knife
1 6″ combination pliers
1 7″ S. C. pliers
1 6′ rule
1 3″ screw-driver
1 file and handle
1 6″ screw-driver

WELDING (ELECTRIC AND GAS)

Floor area—2,000 square feet dirt floor
2,000 square feet cement floor
Two instructors; one toolkeeper janitor
Gas welding pre-requisite to electric welding
32 gas welding students
16 electric welding students

General Equipment:

1 10-cylinder acetylene manifold with all safety appliances, regulators, and gages, placed outside school building
1 10-cylinder oxygen manifold placed outside school building
35 low-pressure welding stations with regulators, gages and torches
48 steel and firebrick benches
2 general work-benches
2 dry emery grinders, heavy-duty, motor-driven
1 power shear for ⅜″ metal
1 power hack-saw
1 coupon testing machine
8 200-ampere, single generator, welding machines of diversi-field makes
1 portable acetylene generator
Exhaust system to remove fumes from each station or booth
1 annealing oven

Periodically Used Tools:

2 heavy-duty cutting torches
2 heavy-duty welding torches
2 pre-heating torches
16 helmets
16 regulators
16 gages
General tools such as calipers, squares, hack-saws, shears, etc.

Individual Tool Sets:

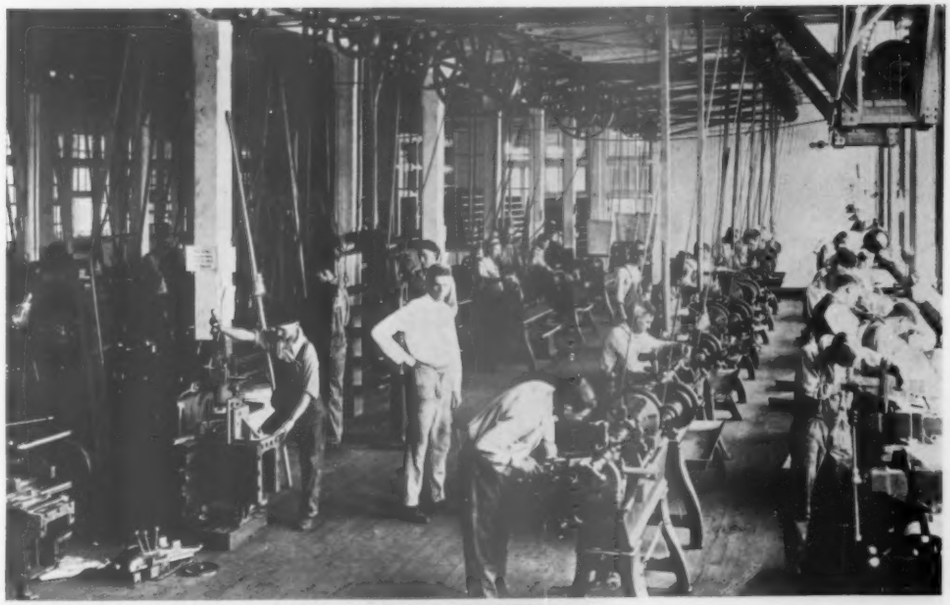
Welding torches; goggles; torch lighter; pliers; hammer; chisels; files; wire brush; rule.

SUPPLEMENTARY AND RELATED SUBJECTS

Such subjects as Drafting, Mathematics, English and Applied Science vary so greatly in individual schools that it would be inadvisable to list such equipment.

Printing-school equipment likewise varies considerably, and special layouts or set-ups can be secured from the printing equipment and type manufacturers who maintain specialists for this particular service.

Stewardship and Baking courses are in the development stage, and the best set-up of equipment is as yet undetermined.



A section of the machine shop, showing type of equipment chosen as suitable for the New Orleans problem. Funds were available for individual motor drives, etc., but this would not have suited the practice in this particular community

The welding trade has grown so rapidly owing to technological changes in industry that the school shops are constantly being enlarged and provided with safer and more efficient equipment. In this particular department, all oxygen and acetylene cylinders are being installed external to the building with safety manifolds and regulators and welding stations

A unique combination of library and English room, specially equipped for the teaching of trade English with trade journals and manufacturers' publications. The proper use of trade catalogs is also taught

Instruction in commercial cookery is provided. The dishes prepared are served in the adjoining cafeteria

The boys gain practical experience by working with utensils and other equipment used commercially

The students have an opportunity to serve from a modern counter and are responsible for cleaning up

Equipment Budgeting

When we have before us this tentative list of equipment, we can proceed on a definite budget therefor. A preliminary cost estimate can very easily be made at this point.

Individual tool sets, and the periodically used tools, should be chosen from the types used in the current practice of the community, rather than ultra-modern or novel types, and chosen of such a substantial grade as would last a journeyman worker a period of fifteen to twenty years.

The group tools and heavy equipment should be chosen for a 20- to 25-year life under commercial shop conditions, and very careful consideration should be given to the types in use in the community and the tendency to modernize in that community. This will always be a test of judgment. It must ever be remembered that the school is preparing the graduate to start in the community as it is, but with a foundation that makes him adaptable to modernization and technological advancement.

If after determining the total cost on the above consideration, it is found to exceed the total allowance, look to the possibilities of assured funds for replacements, repairs, and additions in succeeding years. If such funds are apparently assured by sinking-funds, earmarked appropriations, or otherwise, then proceed to re-vamp the specifications, choosing the heavier or group equipment for a shorter anticipated life (fifteen to twenty years) and the small tools for a five- to ten-year span.

Budgeting for Prevocational Instruction

There are now under development over the country a great number of schools of a pre-vocational type and a great number of pre-vocational shop courses in other schools. The equipment for these shops should come under the same general consideration as for the strictly industrial, as far as balancing first cost against annual upkeep. But there are other considerations that will reduce first cost significantly.

This reduction in cost, however, should not be effected in the quality of the small or individual tools. In fact, the nature of pre-vocational work is such as to impose greater wear on the tool. But consideration can be given to reducing the individual assortment and resorting more to the group, or common, tool assortment.

In pre-vocational types of shops a portable or semi-portable machine may often properly replace the rugged or the precision machine of the strictly industrial type of shop. The modern portable and semi-portable machines accomplish wonders in the teaching of simple fundamental operations when high skill and precision are not the objective.

The Problem of Obsolescence

Equipment for all crafts should be actual working units of such types and capacities that they can develop the principal operating problems of the industry. Most of this type of equipment has a physical life greater than necessary for educational requirements. The greatest difficulty is for the school to keep pace with the rapid technological advancement in types. We therefore need to determine sizes or capacities that will furnish the most important fundamental problems, yet keep the investment down to where new models can replace the old with minimum loss.

Manufacturers suffer from schools carrying on training with obsolete machinery, and they are willing to make many concessions for strictly educational equipment. But too often we use equipment for working loads that prohibits disassembling for training.

Extremely good judgment must be used in purchasing this kind of equipment, for joint utilitarian and educational use. This applies particularly to steam engines, diesel engines, and refrigeration equipment. Let us so plan that the manufacturers may have their faith increased, and they will aid in keeping the instructional equipment modernized.

Now for a few Do's and Don'ts:

A public school seldom can build up a sinking-fund, but an endowed school should set aside a predetermined portion of the endowment for maintenance, modernization and replacement of equipment. The percentage set aside should correspond to the span of life determined in the original set-up. And, then, this fund should be kept at work and the institution kept out of ruts. Many institutions have set aside such funds but have hoarded them beyond belief, and an obsolete school equipment is abhorrent.

Don't be extreme. Don't set out to buy the best the market can offer. Don't set out to buy at the lowest possible cost. Don't try to reproduce someone else's design—fine though it may be.

In general, the proper selection of equipment for an industrial school is not so much a matter of selecting the best-wearing or the most efficient production equipment, or the lowest per capita cost, but, rather, a balancing for a particular community of the initial cost against the available funds for maintenance and replacement as seen in that community.

BROWN & SHARPE MFG. CO.

Providence, R. I.

"World's Standard of Accuracy"

GRINDING MACHINES

Universal — Plain — Surface — Cutter and Tool

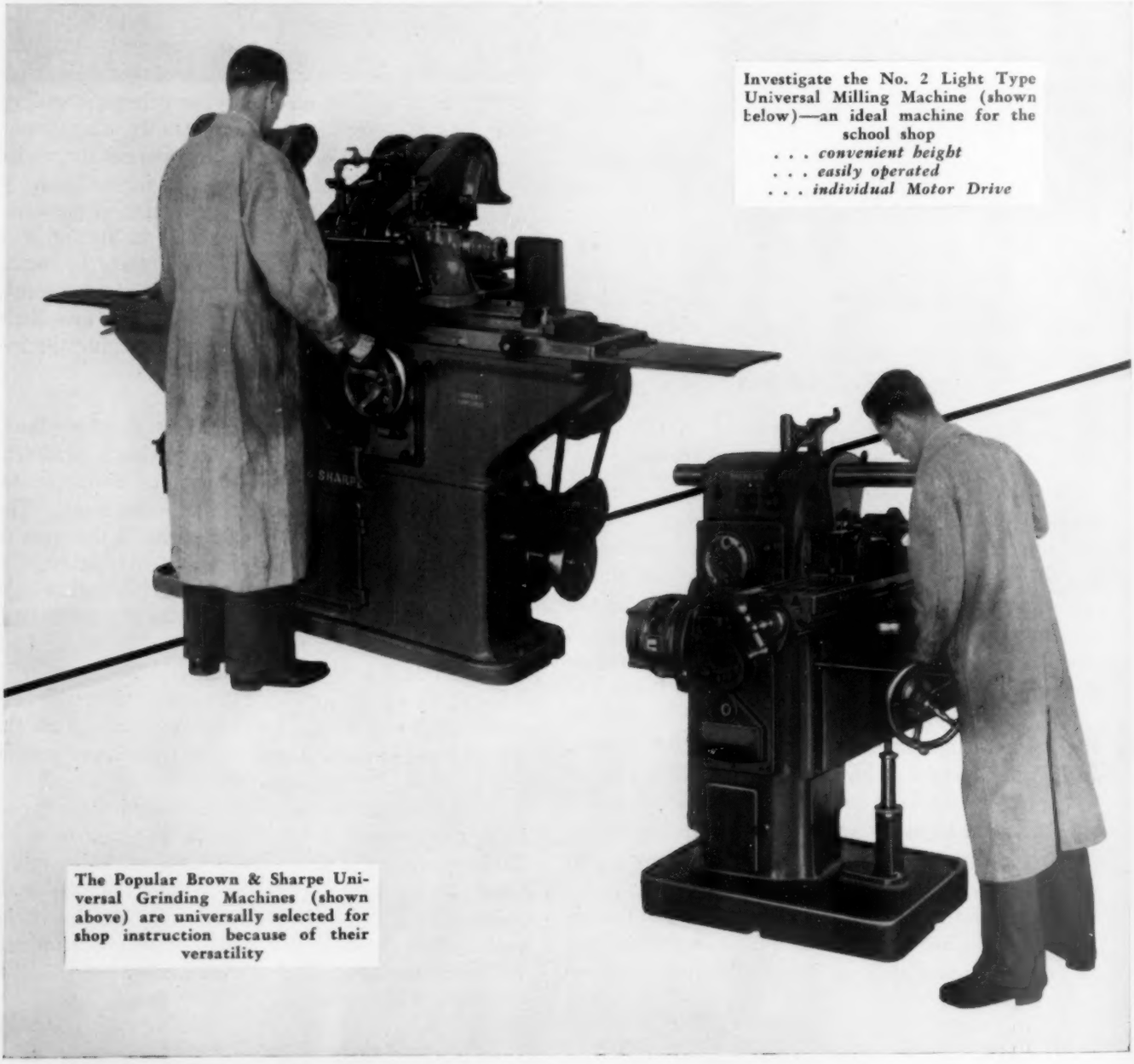
SCREW MACHINES

Automatic and Wire Feed (Semi-Automatic)

MILLING MACHINES

Universal — Plain — Vertical, including toolroom and manufacturing types.

Detailed Specifications of any size or type of machine gladly sent on request



Investigate the No. 2 Light Type Universal Milling Machine (shown below)—an ideal machine for the school shop
. . . convenient height
. . . easily operated
. . . individual Motor Drive

The Popular Brown & Sharpe Universal Grinding Machines (shown above) are universally selected for shop instruction because of their versatility

MACHINISTS' TOOLS

Micrometers — Calipers
Verniers — Gages
Indicators

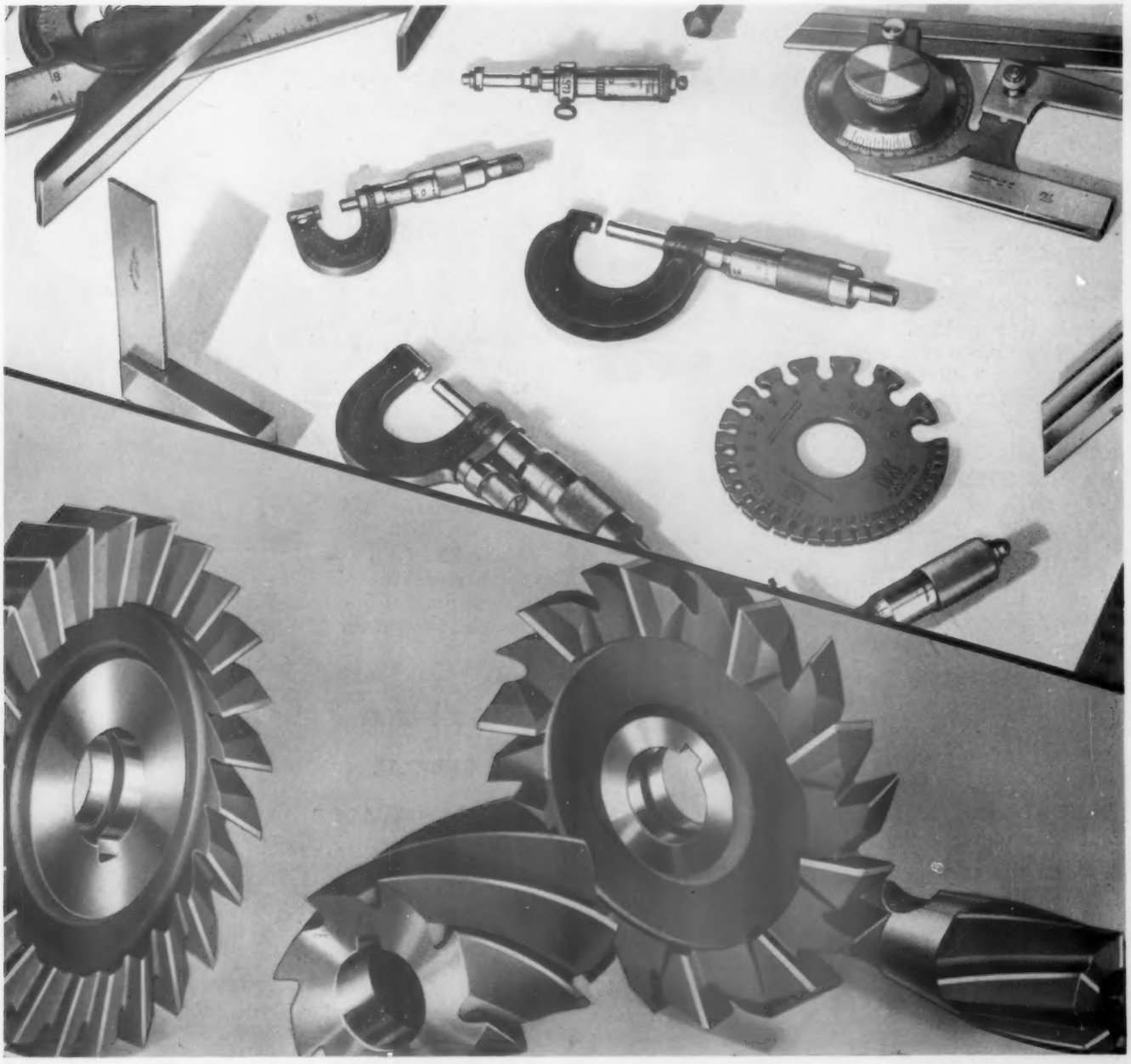
MILLING CUTTERS

Plain Milling Cutters
End Mills
Face Mills
Slitting Saws
Gear Cutters
Hobs

MISCELLANEOUS SHOP EQUIPMENT

Arbors and Collets
Ground Flat Stock
Surface Plates
Magnetic Chucks
Vises
Pumps

Catalog of complete line on request



STANLEY TOOLS

EDUCATIONAL DEPARTMENT

New Britain, Conn.

STANLEY "Boy Proof" TOOLS

FOR WOODWORKING AND FARM SHOPS • ELECTRICAL SHOPS • FORGE SHOPS SHEET METAL SHOPS • AUTOMOBILE SHOPS • MACHINE SHOPS

No. 52½ 10 Oz. HAMMER

Super heat treated head. Evertite oil treated handle of selected straight grain hickory. Patented wedges.

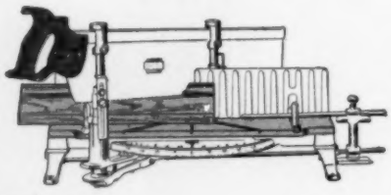
No. R40 EVERLASTING CHISEL

No lost or battered handles. Rubber composition handle, practically unbreakable, moulded about shank. Blade, shank and head one piece of finest steel.

No. 617 HAND DRILL

New chuck with hairpin type springs. Heavy crank, solid wheel, several other important features. ¼" chuck capacity. Hand Drill No. 626 has ⅜" chuck capacity.

No. 2246 MITRE BOX

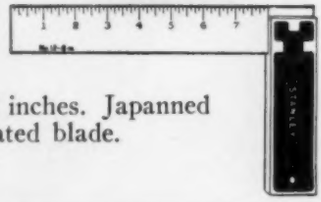


Simplified design. Swivel and uprights one piece of malleable iron. Malleable iron saw guides with roller bearings.

No. 80M SCRAPER

Practically unbreakable. Body and handles one piece of malleable iron.

No. 12 TRY SQUARE



Graduated in eighths of inches. Japanned finish handles. Nickel-plated blade.

No. 34½V BOX-WOOD RULE

Improved vertical figures—easy to read in any position. One side graduated in eighths of inches—other side in sixteenths. Brass tips protect ends.

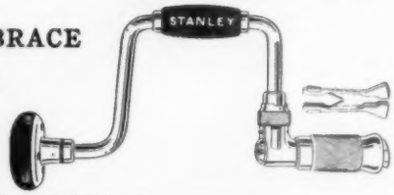
No. 5¼ JUNIOR JACK

Well balanced, lightweight. Ideal size for Junior High School student.

No. 118 BLOCK PLANE

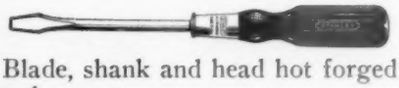
All steel. Minimum number of parts. Lowest cutting angle.

No. 919 BIT BRACE



Self-centering chuck, all parts locked in place. Bronze bushed ball bearing head. Made with 8, 10, 12 and 14 inch sweep.

No. 20 SCREW DRIVER



Standard blade. Blade, shank and head hot forged from one piece of steel.

No. 151M SPOKE SHAVE

Malleable Iron—practically unbreakable. Cutters of finest steel correctly hardened, tempered and sharpened.

•

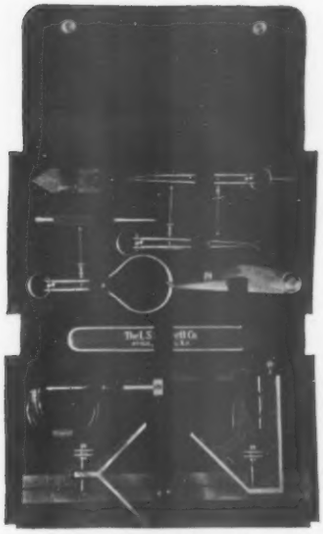
SEND FOR SPECIAL SCHOOL CATALOG NO. 34A

Catalog 34A, in its 204 pages, contains much useful material in addition to complete descriptions and specifications on Stanley Tools. Get your copy free and use it as a handbook for tools and their use.

THE L. S. STARRETT CO.

World's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy

Athol, Mass., U. S. A.



Starrett Student Set
No. 902

Starrett Tools are standard school shop equipment. The features that make Starrett Tools the choice of experienced craftsmen are just as helpful to students and apprentices.

Starrett Student Kits are made up of the tools which instructors agree are essential for class projects. The tools which they contain are all of genuine Starrett quality. They combine accuracy and durability in a way that gives lasting service and satisfaction.

The Starrett Kits and more than 3,000 fine mechanical tools, tapes, rules and hacksaws are completely described and illustrated in the revised edition of Starrett Catalog No. 25 SU. Write for a copy.

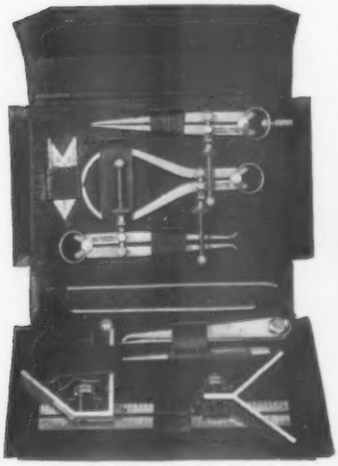
No. 230

No. 436

STARRETT EDUCATIONAL SETS

Designed to teach classes how to use precision tools, the Starrett Educational Set is a valuable aid to instructors. It consists of fourteen 8″ x 10½″ blue-printed pages, punched to fit a standard student's notebook. Each page illustrates a different tool and shows how to use it. Furnished to instructors and students at cost—10c. per set.

No. 153

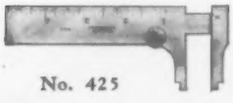


Starrett Student Set
No. 900

No. 530

Starrett Educational Set

No. 11



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No. 92

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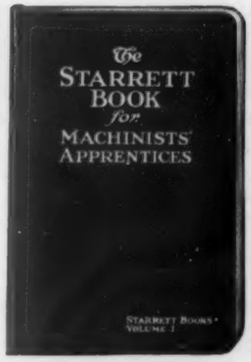


Use Starrett Tools

7562

OZALID CORPORATION

354 Fourth Avenue

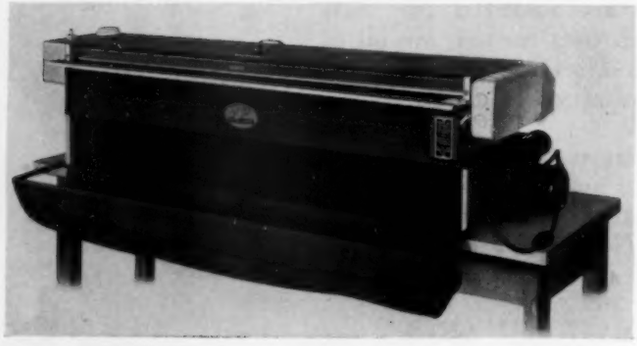
BRANCH OFFICES, DISTRIBUTORS AND DISTRICT REPRESENTATIVES IN ALL PRINCIPAL CITIES

Ozalid WHITE PRINTS

New York., N. Y.

Look for "Ozalid" in Your Local Telephone Directory

The Original Dry Developing White Print Process



The Ozalid "Type 600" Developing Machine . . . a small unit which will handle all Ozalid Materials up to and including 36 inches in width at a maximum developing speed of 18 linear inches per minute

teach your students
the most modern method of making prints

Vocational training is truly modern when the Ozalid Process is used, because this advanced method of making prints is rapidly replacing blueprinting and other photo-reproduction processes throughout industry.

the simplest, cleanest and fastest
photo-reproduction process ever developed

Contrast the two simple steps of the Ozalid Process with the many operations of the conventional blueprinting process, or with other direct printing methods. There are no fussy solutions or intricate baths to prepare . . . no confusion of tanks or plumbing . . . no drying or trimming.

With Ozalid Equipment the average student can not only make perfect blue-on-white prints, but prints with black or maroon lines on several weights of white paper . . . or opaque sepia lines on transparent tracing cloth or paper . . . even black or blue lines on standard opaque blueprint cloth.

exclusive features effect time-saving
short-cuts in drafting practices

The exclusive dry-developing feature of the Ozalid Process provides, for the first time, a simple and certain method of duplicating tracings or drawings on transparent papers and cloths, thereby effecting many time-saving short-cuts in drafting procedure.

Electric motor manufacturers, for example, report substantial savings in drafting time through preparing but one standard drawing for one type of motor, then adding minor changes to an Ozalid Transparent Duplicate, thus securing a new original from which any number of prints can be made. All this is accomplished without redrawing the standard or master detail or resorting to costly and cumbersome photo-reproduction methods.

compact and complete . . .
a complete print room in itself

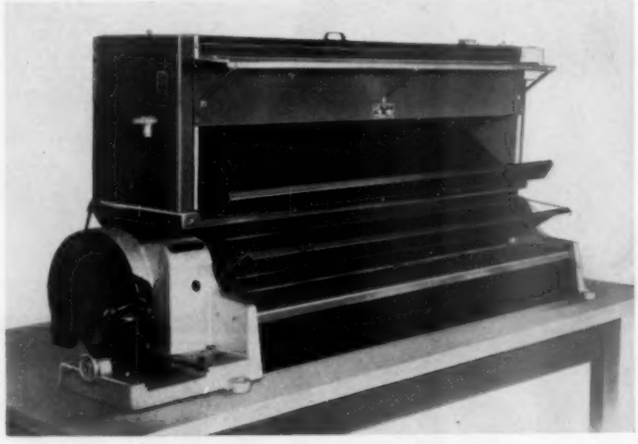
The Ozalid Process saves space! A complete printing and developing unit for school use is less than 68 inches long, 22 inches wide, and 27 inches high . . . so compact and so clean that it can be used on a table in the corner of a classroom, no other equipment such as washing tanks, dryers, or trimming tables, being required.

Ozalid White Prints are easy to
read, check, and correct

Clean and clear Ozalid White Prints save eyes and errors. They are easier to read, check, and correct . . . and they often prevent the costly errors which are caused when details or corrections are obscured by a confusing blue background or by undependable developing methods. And Ozalid White Prints are true-to-scale because they are developed dry.

write for complete information

The cost of Ozalid Equipment should come well within any budget . . . and operating costs, too, are low. Write for complete information. A descriptive folder, samples and prices will be sent without cost or obligation.



The Ozalid "Type 1000" Developer with Wickes Printer . . . a complete printing and developing unit having a speed of 32 linear inches per minute for all Ozalid Materials up to and including 42 inches in width

WICKES BROTHERS

Manufacturers of
Continuous Electric Blue Printing Machines

Saginaw, Mich.
Established 1854

Make Low Cost BLUE PRINTS *in your own shops*

SPEEDY SIMPLEX MACHINE CUTS BLUEPRINT COSTS

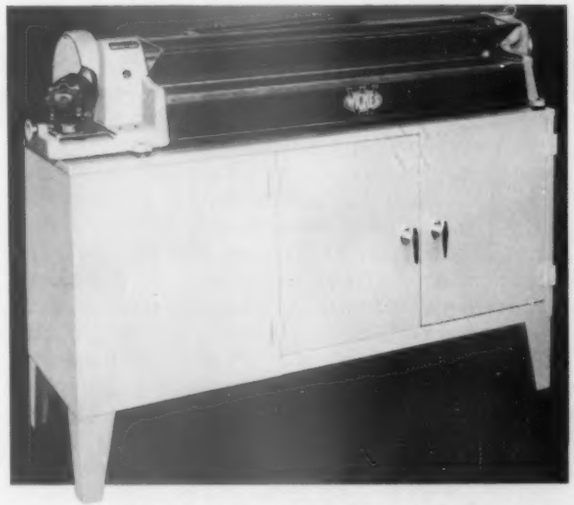
Here's the machine you've been looking for! A practical portable blueprinter that produces regulation blueprints up to 42″ wide in less than 3 minutes. Its vapor-tube lamp heats up in 55 seconds. It operates for a fraction of the cost of operating other type machines. It makes no faint or streaky prints. All the way around it's handy, compact and fool-proof.

HERE'S WHAT *this little machine will do:*

1. Make prints from single sheets or continuous rolls (up to 42″ wide).
2. Prints paper from blueprints or Van Dykes.
3. Prints paper for special developing processes such as: Ozalid, Maroon, Black and White, etc.
4. Will produce up to 250 square feet per hour.
5. Makes even, sharp, clear prints of any type.

The Wickes Simplex Printer is complete—ready to plug in (no special wiring necessary). It is equipped for any usual type of electrical current. Ask for prices and facts about special trial offer.

HANDY SIMPLEX CABINET. Here is just the cabinet you'll want for your Wickes Simplex Blueprinter. Has plenty of room for your blueprints. Has light-proof doors. Rigidly built of 20-gauge auto-body steel. Aluminum finish.



A SIMPLEX MAKES YOUR OWN BLUEPRINTS AT VERY LOW COST.

★ ★ ★

THE NEW BRITAIN MACHINE CO.

New Britain, Conn.

"NEW BRITAIN" "NONE BETTER"

Shop Equipment and Tools

Industrial Arts Locker Bench

"NONE BETTER" SHOP EQUIPMENT

The New Britain Line of Steel Shop Equipment was designed by "New Britain" Engineers, to meet increasing demands for durable, splinter-proof, fire-proof shop benches. The understructure of every "New Britain" bench, is of **all steel,** arc-welded, or electric spot welded, construction. Handsome in appearance, easily cleaned, with dust-proof legs and feet, solid, rugged, durable to an extreme, "New Britain" equipment will outwear and outlast by many years, inferior wooden construction with creaky joints, wobbly supports, and ugly design. Send for our Catalog 707-SE containing details of machinists' benches, sheet metal work benches, glue and stain benches, welding benches of every character, cabinet and locker benches, art and drawing tables, etc., etc.

SEND FOR OUR NEW ILLUSTRATED CATALOG NO. 707-SE FOR FULL DETAILS

Manual Training Bench No. 91008P

All Steel Work Bench

"NONE BETTER" TOOLS

A wrench set of 140 pieces making a complete tool outfit to meet the increasingly complicated demands that are being made on automotive mechanics. The wide range of sizes and the special tools for particular jobs make this set a complete tool kit. The selection of parts has been made only after the most careful study of what are necessary tools. All duplications and non-essentials have been eliminated. These 140 pieces make possible not only 140 tools, but an almost limitless number of combinations to build up complete individual tools in ¼", ⅜", ½" and ¾" square drive. These combinations can be made quickly and owing to the special features, such as keyless lock on sockets, will prove to be as rigid and sturdy as the more expensive one-piece tools. As an added convenience these tools are packed in a heavy steel tool chest 24" long by 11⅝" high x 9⅜" deep, with three detachable drawers and a handy Tote Tray with ample room for those special tools every mechanic has. "None Better" tools are made from the highest grade chrome alloy steel by trained mechanics and are correct in weight, style and balance. They are also most attractively finished in a triple chromium plate.

Our No. 38 catalog gives full information about **"None Better" Tools.**

Wrench Set No. 6000

AMERICAN SAW MILL MACHINERY CO.

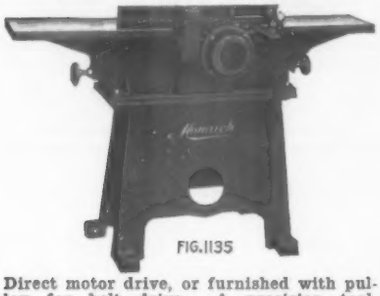
190 Main Street Hackettstown, New Jersey

We illustrate and briefly describe below a few of the more important MONARCH Woodworking machines suitable for school use.

MONARCHS are modern, fast, accurate, sturdy, moderate in price. There is no compromise with quality; you are assured a machine giving accurate work, trouble-free operation, and a lifetime of service.

MONARCH machines are made throughout of the finest materials, and embody the best of workmanship and finish. These machines are guaranteed to give satisfactory service.

8", 12" AND 16" BALL BEARING JOINTERS



Direct motor drive, or furnished with pulley for belt drive. A precision tool, suited for fine pattern making or hard, continuous general service

SPEED LATHES

Ball bearing motor headstock as shown, or with motor in leg. A machine of great accuracy; compact, sturdy and efficient. Used in hundreds of pattern shops and industrial schools. Hand feed carriage with compound tool rest can be supplied

MONARCH PATENTED SAW GUARD AND KICK-BACK PREVENTER

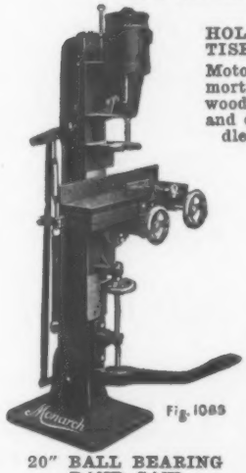
In a class by itself. Completely guards both front and back of saw and provides absolute protection against "kick-back." Conforms with all safety requirements. May be applied to all our saw benches.

DRUM AND DISC SANDER— BALL BEARING

A thoroughly modern machine, adjustable table and motor mounted in frame on hinged base. Equipped with sawdust chute and container. Also furnished as drum sander only

HOLLOW CHISEL MORTISER—BALL BEARING

Motor or belt drive. For mortising in hard or soft woods. Free from vibration and easy to operate. Spindle speed 3600 R.P.M.



20" BALL BEARING BAND SAW

Built-in motor. Fully guarded, with indexed tilting table. A rugged, accurate machine, giving fine work and long life. ALSO 30"

"JEWEL" PLANER OR SURFACER

Plain or ball bearings as desired. An economical single surfacer for high-speed work; produces excellent work

TILTING ARBOR SAW BENCH

Ball bearings. 16" saw tilts to 45 degrees. Furnished with 2 or 3 H.P. motor. A modern, sturdy, compact machine with self-contained motor built in

VARIETY TILTING TABLE SAW BENCH

Ball bearing. Designed for a wide variety of fine and accurate work. Can be supplied with hollow chisel mortising attachment

HIGH SPEED SINGLE SPINDLE SHAPER

Precision ball bearings. 10,000 R.P.M. Cuts without reversing against, across and with the grain. Quantity production with highest efficiency

WOODWORKING MACHINERY OF HIGHEST QUALITY FOR INDUSTRIAL SCHOOLS

Monarch

Trade-Mark Reg. U. S. Pat. Off.

SEND FOR THE BULLETINS ON THOSE MACHINES IN WHICH YOU ARE INTERESTED

AMERICAN TYPE FOUNDERS

DEPARTMENT OF EDUCATION

200 ELMORA AVE., ELIZABETH, N. J.

TEACH PRINTING

AN IDEAL COURSE OF STUDY FOR SCHOOLS AND COLLEGES

The school printing shop presents many advantages to both the students and the faculty. By providing a publicity medium under school control, it is of great assistance to school executives in interpreting their aims and problems to the community; in "selling" their educational program to parents and officials.

As a course of study, printing ranks high since it brings the student into contact with many fields of thought and action related to school work—history, geography, English grammar, syntax and punctuation, mathematics and art. It creates artistic appreciation by developing a feeling for beauty of line and form; a sense of balance and proportion. It encourages the formation of good habits—accuracy, perseverance and orderliness—and teaches the value of cooperative effort. Its variety of operations offers plenty of room for the development of individual talents and a high degree of manual skill.

"Learn by Printing" is the application of the "Learn by Doing" philosophy. Educators who have tried school printing courses recommend them highly for their cultural and practical value.

PERFECTION *Senior High School Printing Unit*

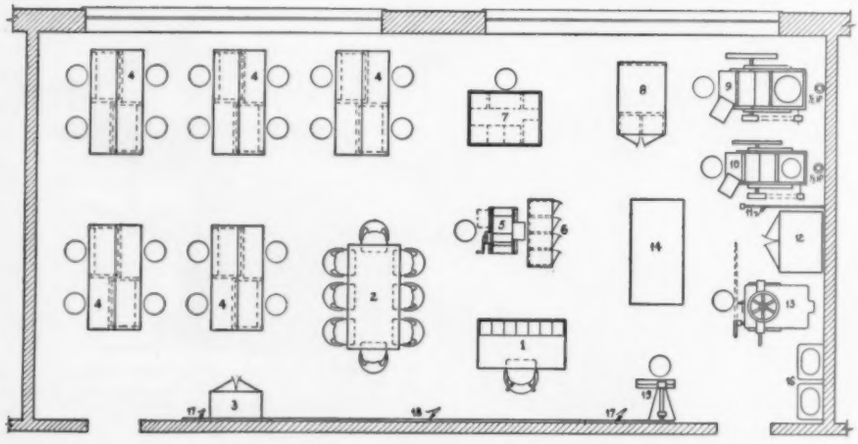
ACCOMMODATES 20 TO 25 STUDENTS

The PERFECTION Senior High School Printing Unit is a complete printing plant designed especially for Senior High School work. This well-balanced unit provides facilities for turning out a wide variety of high quality work and a compact orderly arrangement ideally suited to the instructor's needs. The unit includes only equipment of the highest quality of materials and workmanship.

The machinery is simple in design, easily operated and provided with all the necessary safety features. Type cabinets are substantial and accessible and have no superstructure to obscure the instructor's view of the class. Type faces are well chosen to provide attractive combinations for many types of work. A practical floor plan for the PERFECTION Unit is shown below.

Key to Floor Plan

1—Instructor's Desk
2—Study and Reference Table
3—Bookcase
4—No. 870 American School Type Cabinet
5—No. 1 Vandercook Proof Press
6—No. 13535 American School Galley Cabinet
7—No. 13983 American School Imposing Table
8—No. 9095 American School Pressroom Cabinet
9—12x18 C. & P. Press
10—10x15 C. & P. Press
11—Guard Rail
12—Paper Storage Cabinet
13—Lever Paper Cutter
14—Bindery Table
15—Boston Wire Stitcher
16—Lavatories
17—Cork Exhibit Board
18—Blackboard
◎—Power Intake
○—Position of Student



FLOOR PLAN OF PERFECTION PRINTING UNIT

A LIST *OF EQUIPMENT AND TYPES CONTAINED IN THE PERFECTION SENIOR HIGH SCHOOL PRINTING UNIT*

MACHINERY

1 8x12 New Series C. & P. Platen Press, complete with 3 rollers
2 prs. Roller Supporters
1 Model D Redington Counter
1 C. & P. Platen Guard
1 C. & P. Press Brake
1 New Series Short Fountain
1 Motor Bracket with belt-tightening adjustment including pulley
1 Kimble ¼ h. p. Motor, variable speed, with pedestal speed control, belt drive for local current
1 Endless Leather Belt
1 Wire Mesh Belt Guard
1 Drip Pan, galvanized iron, 4x5 feet, beaded edge
1 12x18 New Series C. & P. Platen Press, complete with 3 rollers
2 prs. Roller Supporters
1 Vandercook Proof Press
1 Model D Redington Counter
1 C. & P. Fibre Flywheel Guard
1 C. & P. Platen Guard
1 C. & P. Press Brake
1 C. & P. Long Fountain
1 Motor Bracket with belt-tightening adjustment including pulley
1 Kimble ⅓ h. p. Motor, variable speed, with pedestal speed control, belt drive, for local current
1 Endless Leather Belt
1 Wire Mesh Belt Guard
1 Drip Pan, galvanized iron, 4x5 feet, beaded edge
1 26½-inch Hand Lever Paper Cutter, C. & P. Craftsman or Challenge Advance, including 2 knives, measuring tape and 4 cutting sticks, and equipped with two-handed safety control
1 No. 5 Boston Wire Stitcher, foot power

TYPE *AND SPACING MATERIALS*

Schoolbook Oldstyle

1 font . . . . . 6 point
40 lbs. . . . . 8 point
200 lbs. . . . . 10 point
30 lbs. . . . . 12 point
15 lbs. . . . . 14 point
20 lbs. . . . . 18 point
2 fonts . . . . . 24 point
1 font . . . . . 30 point
1 font . . . . . 36 point

Century Schoolbook Italic

1 font . . . . . 6 point
1 font . . . . . 8 point
1 font . . . . . 10 point
1 font . . . . . 12 point
1 font . . . . . 14 point
1 font . . . . . 18 point
1 font . . . . . 24 point

Century Schoolbook Bold

1 font . . . . . 6 point
1 font . . . . . 8 point
1 font . . . . . 10 point
1 font . . . . . 12 point
1 font . . . . . 14 point
1 font . . . . . 18 point
1 font . . . . . 24 point
1 font . . . . . 30 point
1 font . . . . . 36 point
1 font . . . . . 48 point

HEAVY COPPERPLATE GOTHIC

1 font . . . . . 6 point No. 21
1 font . . . . . 6 point No. 22
1 font . . . . . 6 point No. 23
1 font . . . . . 6 point No. 24
1 font . . . . . 12 point No. 25
1 font . . . . . 12 point No. 26
1 font . . . . . 12 point No. 27
1 font . . . . . 12 point No. 28
1 font . . . . . 18 point No. 29
1 font . . . . . 18 point No. 30

Wedding Text

1 font . . . . . 8 point
1 font . . . . . 10 point
1 font . . . . . 12 point
1 font . . . . . 14 point
1 font . . . . . 18 point
1 font . . . . . 24 point

SPACES AND QUADS

5 lbs. . . . . 6 point
15 lbs. . . . . 8 point
60 lbs. . . . . 10 point
20 lbs. . . . . 12 point
10 lbs. . . . . 14 point
10 lbs. . . . . 18 point
10 lbs. . . . . 24 point
5 lbs. . . . . 30 point
5 lbs. . . . . 36 point
1 font . . . . . 48 point

5 fonts No. 9011D 2 point Leads, 5 to 9½ picas
5 fonts No. 9011E 6 point Slugs, 5 to 9½ picas
10 fonts No. 9011F 2 point Leads, 10 to 40 picas
10 fonts No. 9011G 6 point Slugs, 10 to 50 picas
5 lbs. No. 1002 2pt. L. S. Brass Rule
5 lbs. No. 2082 2pt. L. S. Brass Rule
1 font No. 1002 2 point Miters for Rule
1 font No. 2082 2 point Miters for Rule
25 lbs. Metal Furniture, L. S. font
5 lbs. American Line Leaders, 10 point, Series 546, 4 dots to the em
1 lb. 10 point Braces and Dashes
1 lb. 10 point Fractions
½ lb. 10 point Reference Marks
1 font Series 21 Parentheses and Brackets
1 No. 20 Assortment Thin Spaces with Quarter Size Case

FURNITURE

5 No. 870 American Perfection School Type Cabinets, steel construction, with cases
1 No. 13983 American School Imposing Table, steel construction, including reglet and furniture
1 No. 13535 American School Galley Cabinet, steel construction, with capacity for 100 galleys
1 No. 529 American School Pressroom Cabinet, steel construction
1 No. 15038 Bindery Table, size 36x72 inches
1 No. 15050 Padding Attachment
1 No. 15047 Stock Forwarding Table
2 No. 3045 Quarter Size Rule Cases
1 No. 3185 Leader Box

MISCELLANEOUS

20 Rouse Pica Composing Sticks, 6x2, stainless steel
1 Rouse Job Composing Stick, 10x2, stainless steel
1 Rouse Job Composing Stick, 15x2, stainless steel
100 Pressed Steel Galleys, 8¾x13 inches
2 All Brass Job Galleys, 8¾x13 inches
1 All Brass Job Galleys, 12x18 in.
1 Success Benzine Can, quart size
1 Justrite Benzine Storage Can, gallon size
1 Stapleset Benzine Brush No. 1, oval back
1 No. 5805 Hickory Mallet
1 No. 5839 Type Planer, 3⅛x6 in.
1 No. 5835 Proof Planer, 3⅛x8 inches, with leather top
1 doz. Challenge Quoins No. 1
1 Challenge Quoin Key No. 1
1 doz. Megill Spring Tongue Gage Pins
1 doz. Megill No. 2 Original Steel Gage Pins
1 Boston Model No 1. Typographic Numbering Machine, 5 wheels
1 Line Gage, Rouse No. 2, pica and nonpareil, 12 inch
1 Oily Waste Can, NcNutt No. 3
1 lb. Amtyco Printing Ink in ¼ lb. tubes, assorted colors
10 lbs. No. 25 Bookbinders' Wire on 2 steel spools
1 ball Page Cord
1 set of "Visual Aids for Instruction in Printing," 24 charts 11-x14 inches
1 copy "The Practice of Printing," by Polk
1 copy "Student's History of Printing," by Haines
1 No. 1 Universal Cylinder Bellows
1 No. 604 Style B Square End Ink Knife
1 No. 30 American Lead and Rule Cutter
1 quart Make-Ready Paste
1 quart Tabbing Compound

Types used: Bernhard Gothic Medium and Italic and Stymie Black

AMERICAN TYPE FOUNDERS

EVERYTHING FOR THE SCHOOL PRINTSHOP

TYPE CABINETS

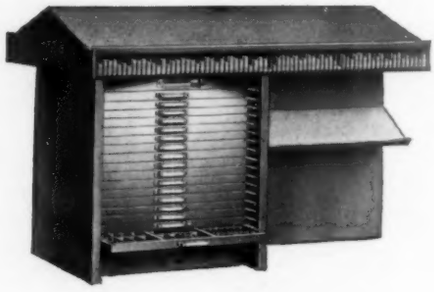
A VARIETY OF MODELS TO MEET EVERY SCHOOL PRINTSHOP NEED

COMBINATION PRESSROOM CABINET AND STOCK TABLE

For drying sheets and storing inking rollers and materials. A compact and efficient cabinet that saves space and steps. Stock table contains drying rack with 12 drying frames accessible from both sides, ink and roller compartments, a bin for rags and drawers for tools.

TRADE CLASS TYPE CABINET

A sturdily constructed steel cabinet. Plenty of room for liberal supply of spacing materials provided by the double depth lead and slug rack on top. Double work bank top provides a full length working surface for the use of 8¾x13 galleys. Contains two tiers of 24 full size, standard depth California job cases with combination pulls and label holders. Finished in olive green baked enamel with black enamel top. No. 12008.



PERFECTION SCHOOL TYPE CABINET

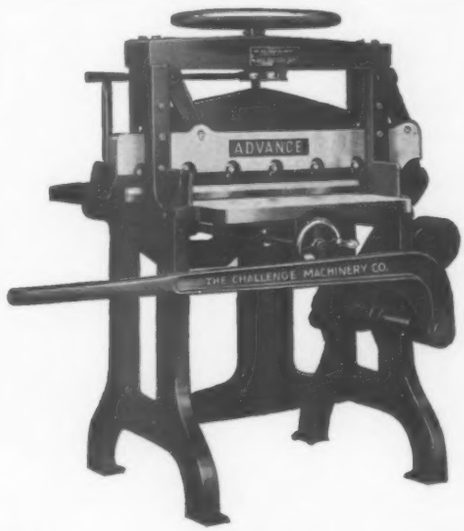
A hardwood cabinet accommodating four students. Steel double work bank top with handy lead and slug rack under each working edge. No superstructure to obscure the instructor's view of the class. Contains 26 California job cases, two blank cases and four Wells Font cases. Sanitary raised base makes sweeping easy. Flat varnish finish. No. 9192.

AMERICAN IDEAL SCHOOL TYPE CABINET

A substantial hardwood cabinet accommodating two students. Contains one No. 2701 blank case, thirteen No. 2735 California job cases, and two No. 2765 Wells Font cases, all full size. Sanitary raised base. Flat varnish finish. No. 9190.

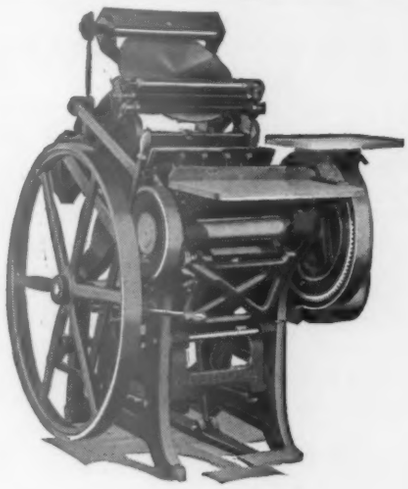
PRINTSHOP MACHINERY

ACCURATE, UP-TO-DATE EQUIPMENT DESIGNED FOR SCHOOL USE



ADVANCE LEVER PAPER CUTTER

A strong, accurate and economical cutter. Planned to give the greatest power on cutting lever without back-breaking effort. Duplex measuring tape with easy-to-read indicator permits measuring odd multiples of ⅓, ⅛ ,½ inch, etc. Three sizes 19, 26½ and 30 inches.



CHANDLER & PRICE NEW SERIES PRESS

A safe, simply operated press that will turn out unusually high quality work. Standard equipment: Single disc throw-off, depressible grippers, 3 semi-steel chases, 6 roller stocks, 6 roller trucks, 2 wrenches, crankshaft and combined gear and pinion guard. Chase sizes, 8x12, 10x15 and 12x18 inches.

VANDERCOOK PROOF PRESS

Ideal for all hand inking work within its size. Positive, even impression either large or small forms. Strongly constructed and easily operated. Accurate, rigid and accessible. Printing surface 14x18 inches. No. 1.

BOSTON WIRE STITCHER

For both saddle stitching and side stitching work. Capacity ranges from two sheets to ½ inch; four cutting surfaces; singly adjusted to thickness of work by using hand lever. No. 5.

ATF CARRIES A COMPLETE LINE OF EQUIPMENT AND SUPPLIES FOR EVERY PRINTSHOP • FOR EVERY BUDGET

For more than forty years ATF, manufacturer of foundry type and Kelly Presses, has been America's leading supplier of printing equipment. More than 4000 items comprising every need of the modern printshop are regularly carried in stock. ATF maintains a staff of expert printing consultants, experienced in school problems who will be glad to discuss your individual problems with you and offer you their advice. Write to the American Type Founders, Department of Education, 200 Elmora Avenue, Elizabeth, New Jersey. A complete catalog of school printing equipment will be sent on request.

WALKER-TURNER CO., INC.

228 Berckman St. Plainfield, New Jersey

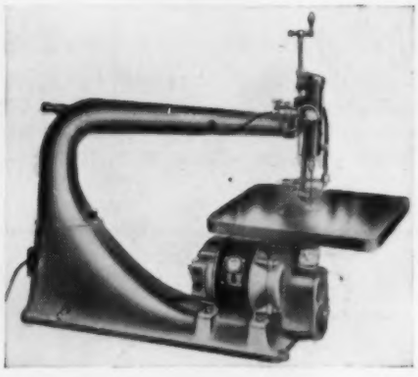
GEARED POWER . . . THE BIG NEWS FOR 1938!

Now, for the first time, Walker-Turner applies the principle of the geared drive—tested and acclaimed by industry—to sturdy, inexpensive machines for school shops.

Tests with the same motor show an increase of delivered power up to 40% over the belt and pulley drive. Increased power results from the elimination of belt friction and slippage . . . convenience and economy from the elimination of belt wear, adjustments and replacements . . . safety from the elimination of all exposed moving parts.

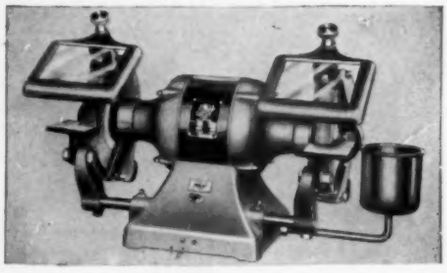
Walker-Turner offers other outstanding improvements for 1938—in precision tools at low price—possible because years of intensive research, engineering and production, entire plant and staff facilities, have been concentrated on small power tools alone.

• READ THESE FEATURES •



MJ917 JIG SAW

has the Direct Drive with crankshaft mechanism. Fingertip Speed Control that flips from low to high speed without stopping the motor. Motion Blade Tensioner which permits accurate tensioning while in motion. Throat capacity of 24". 15" x 14" Tilting Table.

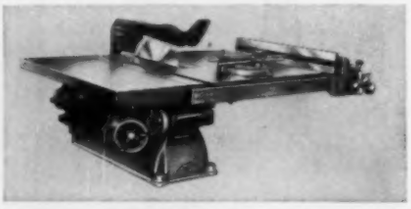


GR50 GRINDER

has ½ H.P. capacitor start motor with a high grade condenser built into the base. Provides ample overload capacity. Large grease-sealed ball bearings. 7" x 1" wheels turn at 3450 R.P.M. Full protection guards, safety glass shields, and cooling cup are regular equipment.

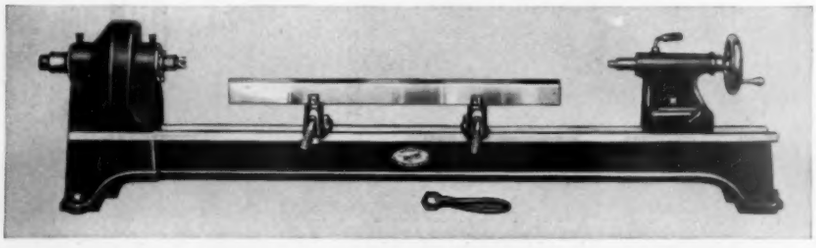
BN1125 BAND SAW

rips any length, cuts exact angles measured by the mitre gauge, arcs and scrolls as fed, bevel cuts any angle to 45° by the patented table tilting device. Capacity 16" blade to frame, 12" upper guide to table. 29,000 feet of saw teeth a minute slice thin stock or "hog" through beams. Ball bearings on shafts and guides. All-around safety by wheel guards, back blade guard, and front telescoping guard.



B966 BENCH SAW

has a 10" blade that cuts to a full 3" depth. Big 21" x 15" table, 21" x 31" with extensions, tilts for angle cuts to 45° by hand wheel and worm gear mechanism. Arbor raises and lowers. Mounted on dust-proof ball bearings.

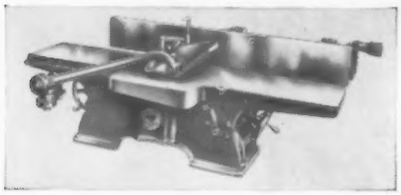


L900 LATHE

turns wood up to 37" long. Has 10" swing over bed. Can take larger face plate work on outside end of head spindle. Built sturdy enough for metal turning and spinning with Walker-Turner accessories. Hollow head spindle ⅝" inside diameter, mounted on ball bearings of ample thrust and radial capacity. Morse Taper centers.

WALKER-TURNER

THE AMERICAN SCHOOL AND UNIVERSITY



P906 JOINTER

has three special steel knives that plane stock up to 6″ wide, any length, and rabbet corner cuts to ½″ deep. Dual-purpose guard provides real safety even when planing to ribbon thickness or strip width. Both tables adjustable on dovetail ways for depth of cut. Fence tilts forward or backward for angle work. Ball bearings on spindle.

SM900 SURFACER

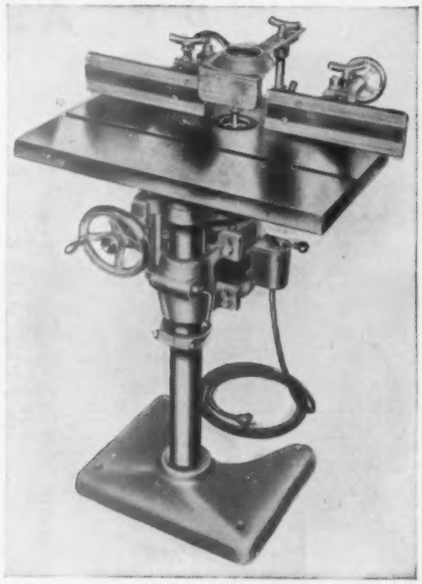
is a three-in-one finishing machine that does both belt and disc sanding for small work and mitre joints; "stroke" surfacing for panels up to 30″ wide, any length, using the stroking block. Belt is 4″ x 64½″. Disc 10″ in diameter. Four speeds. Disc table tilts to 45°.

PR102 FLEXIBLE SHAFT

sands, grinds, cleans, buffs, polishes, drills in difficult places, does innumerable "long reach" jobs. This heavy duty model has ½ H.P., 3450 R.P.M. capacitor type motor. 5′4″ rubber covered, reinforced shaft. Ball bearings in hand piece, jackshaft and motor. Telescoping column adjusts 42″ to 57″ above floor.

D925 DRILL PRESS

has the exclusive Walker-Turner six-spline spindle that minimizes vibration. Four precision ball bearings. Pilot wheel feed with calibrated depth stop lowers spindle 4″. Unusually soft yet positive return spring action. 10″ x 9″ table tilts to any angle. Jacobs (0″ to ½″) key chuck. Four speeds. Rigid 2¾″ steel column.



S980 SPINDLE SHAPER

has ¾ H.P. motor and new ***direct gear drive*** turning the spindle at 7600 R.P.M. Does all forms of shaping as well as tenoning, dadoing, reeding, fluting, surface grinding, drum sanding, panel carving, and lock corners for boxes. Hand wheels raise and lower spindle, adjust fences. 26″ x 16″ table. Safety guard. Ball bearings.

TA1162 TILTING ARBOR SAW

gives the non-stalling power of the ***direct gear drive***, plus the advantages of the tilting arbor that permits angle cuts to 45° with table always horizontal. 10″ blade raises by worm gear and hand wheel to cut up to 3″ stock; lowers to below table top. 27″ x 20″ table. Ball bearings. Adjustable fence. Self-indexing mitre gauge.

TA990 TILTING ARBOR SAW (Not shown)

is similar in appearance to the TA1162 but smaller in size. Has 8″ blade and cuts to 2″ depth. Like the bigger model, it takes the improved TA5 safety guard with "kick-back" pawls, and the P906 jointer on brackets to make a combination Saw-and-Jointer on one compact base.

See the three complete lines of Walker-Turner Power Tools in three price ranges at your local dealer's. You'll notice brand new 1938 precision and safety features usually found only in much more expensive tools—and you'll find the prices fit any school budget!

Get the new 1938 catalog by writing today!

Engineered POWER TOOLS

THE AMERICAN SCHOOL AND UNIVERSITY

ATLAS PRESS COMPANY

1890 No. Pitcher Street, Kalamazoo, Michigan

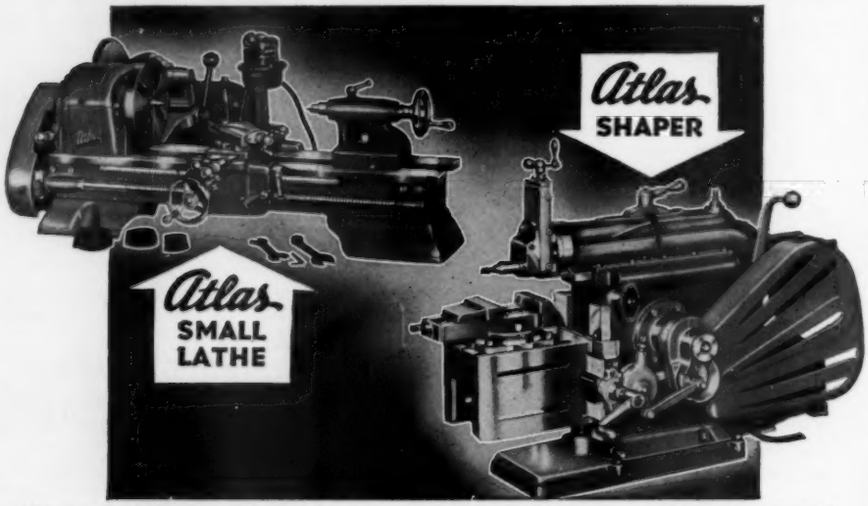
FACTORY DISPLAYS AT

CHICAGO
35 E. Wacker at Wabash

PHILADELPHIA
113 N. Third St.

NEW YORK
130 W. 42nd St.

Atlas Presents 2 New PRECISION MACHINE TOOLS



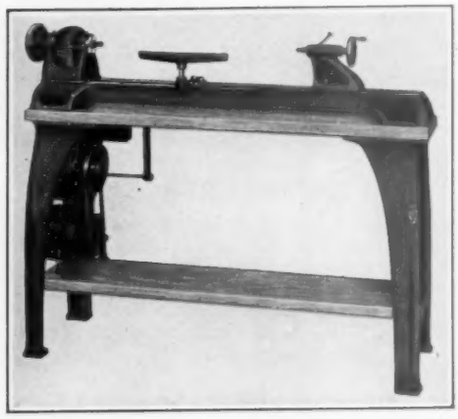
This new Atlas Small Lathe provides everything needed for lathe instruction on small units. It is a back-geared, screw-cutting lathe with 16 speeds, reversible power feeds, integral countershaft, V-belt drive, Timken bearings, and many other features. It is ruggedly constructed to stand the abuse of amateur machinists. There are two sizes—12" and 18" between centers, both with 6" swing. Prices are surprisingly low.

The new Atlas Bench Shaper is outstanding in two respects. First, it has all the precision and power of large machines built down to scale for greater efficiency and versatility on small work. It is ideal for shop instruction courses. Second, its price sets a new standard of value in metal shapers. It has a 7" stroke, 4 speeds between 45 and 200 strokes a minute, and 5 surface feeds. It is economically operated by a half horse-power motor.

Atlas DRILL PRESSES

Everything you need for drill press instruction is provided in the Atlas at sensible prices. There are 4 models. Original Atlas SKF ball bearing heads, splined spindle, balanced pulleys, built-in switch, Jacobs chucks, full tilting table—are but a few of the many Atlas features.

Atlas WOOD WORKING LATHES



This is the latest design modern wood working lathe with deep grooved SKF ball bearing heads, and extra sturdy construction for student use. Made in 2 sizes—10" and 12" swing. Note special stand for safe underneath motor drive.

Atlas 9", 10" METAL WORKING LATHES

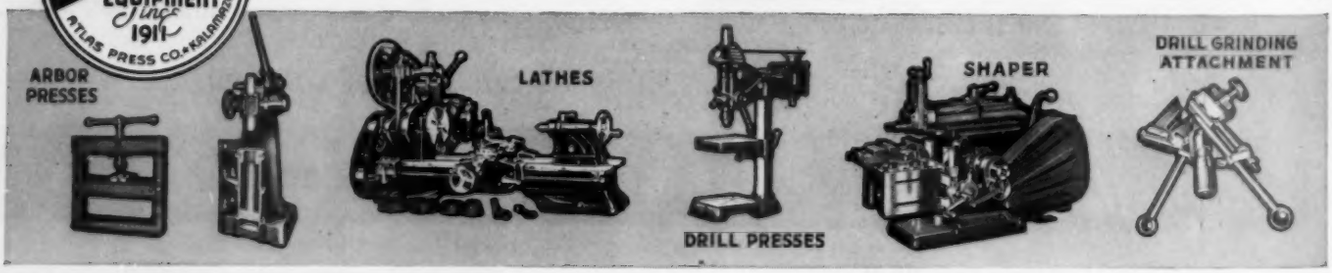
Atlas has made this type of lathe so practical for school use it is no longer necessary to make an investment of hundreds of dollars for instruction lathes. At the same cost several Atlas lathes can be installed to give more students ample opportunity to develop their abilities. Belt guards and floor stands are available.

Atlas QUALITY SHOP EQUIPMENT Since 1911 — ATLAS PRESS CO. KALAMAZOO, MICH.

Send for NEW 1938 CATALOG

NOW, AN UP-TO-DATE MANUAL

272 pages, 325 illustrations—a modern instruction book for modern lathe operation including cutting speeds, feeds, and tool angles for the new metal alloys and plastics, as well as complete lathe operating instructions. Easy to read and understand. New metal binding opens easily and lies flat.



DELTA MANUFACTURING COMPANY

600-634 E. Vienna Avenue

Milwaukee, Wis.

EFFICIENT LOW-COST TOOLS FOR SCHOOL SHOPS

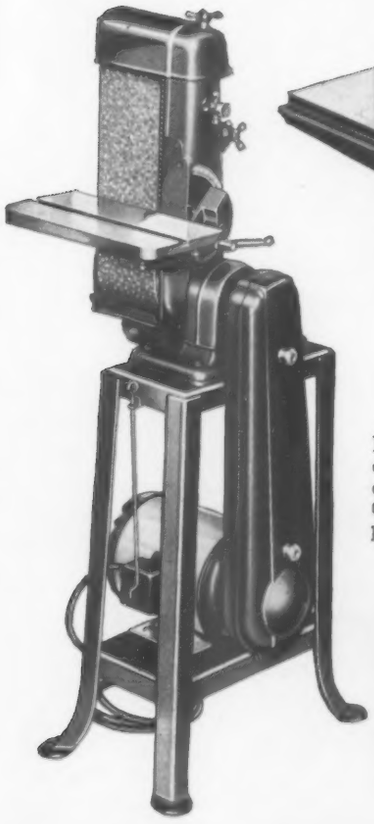
Delta Tools, because of their efficiency, accuracy, convenience and unusually low cost, have been adopted by hundreds of schools and universities all over the country. They are being used for vocational educational classes, laboratories, shops and maintenance departments.

NEW 11-INCH DRILL PRESS

Built to the same standards of precision and accuracy as the 14-inch drill presses, this machine will drill, bore, shape, mortise, rout, sand, carve and grind just like the larger machines. Interchangeable spindles are available, with chuck equipment to suit any job. And it has all the engineered features of the larger machine—full-floating, ballbearing spindle and drive pulley, four speeds, tilting table with index pin, graduated quill and adjustable pointer, stop rod and all the other conveniences.

NEW 10-INCH BAND SAW

Has balanced enclosed disk wheels, running on New Departure double-seal ball bearings, patented table swinging on widely-spaced double trunnions, micrometer adjustment guides and ball-bearing blade supports above and below the table, with the lower-guide adjustments brought out to the front of the table for convenience and safety—and a full 6-inch capacity under the blade guide—where you need capacity in a band saw.



NEW 4-INCH JOINTER

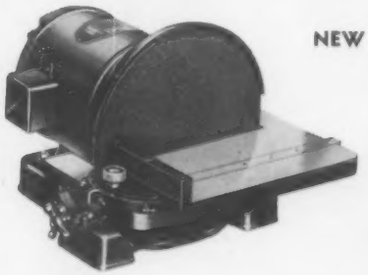
It has the patented fence that insures sure, free action and unvarying accuracy of the settings patented swinging stop with its individually adjusted stop screws, swinging dual-control handle that makes control of the fence so convenient.

NEW 6-INCH BELT SANDER

Has numerous new features including complete double-sealed ball-bearing equipment, full 6 inches of sanding width. Operates in both vertical and horizontal positions.

NEW 17-IN. DRILL PRESS

The greatest drill press value ever offered. Has scores of unusual features. Get the full story in the 1937 Delta catalog.



NEW 12-IN. DISK SANDER

For Finishing, Squaring, Plain or Compound Mitering, Fitting and Grinding on Wood, Metal, Bone, Plastics and many other materials, this new disk sander brings to every shop — large or small — unusual accuracy, dependability and convenience. Has many unusual features. Available in both direct-drive and belt-drive models.

WRITE FOR DELTA CATALOG

Delta tools are ideal for school use. Their cost is low, well within even limited budgets. They are compact and flexible. They are the same tools that students will use in either home shops or industry.

OLIVER MACHINERY COMPANY

Grand Rapids, Mich.

BRANCH OFFICES

50 Church Street, New York City
1450 N. Monitor Avenue, Chicago
901 Bank of Commerce Building, St. Louis
221 Sexton Building, Minneapolis

METAL SPINNING DEVELOPING RAPIDLY

It is easy to learn and the art possibilities are unlimited. Ask Oliver about Metal Spinning.

Metal Spinning Lathes by Oliver have been developed to the point of Leadership in this line. Lathes are powerful. Boys love the work. Lathes can be used for wood turning also.

"OLIVER" OILSTONE TOOL GRINDERS

Junior with 6" Wheels

Every shop using edge tools should have an Oilstone Grinder.

No. 585, illustrated at right, carries two 8" Oilstone wheels, a dry grinding wheel and emery cone.

"OLIVER" CIRCULAR SAWING MACHINERY

Variety Saw Bench

Built in sizes from large heavy saws to junior models. The variety saw, No. 32, as illustrated, carries a 12" saw and is built with tilting saw or tilting table. It is a very popular size.

Important Note: It is impossible with so large a line as the "Oliver" to put specifications into such a small space. We will gladly send to inquirers specifications and literature fully describing any machines in our line.

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are built in many types and sizes from largest pattern makers lathes to junior sizes. No. 51, illustrated at right, is a 12" motor head speed lathe giving all speeds from 600 to 3600 r.p.m.

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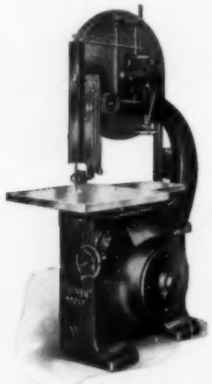
Full line from largest high speed band saws to 18" Junior. We illustrate our popular 30-inch, No. 217.



No. 299 Surfacer is illustrated at right.

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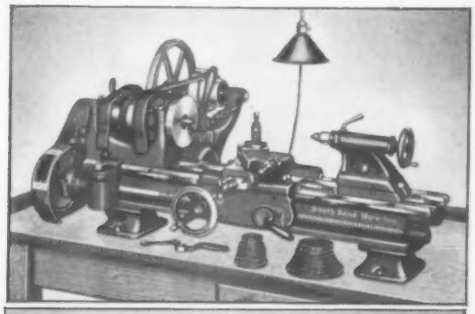

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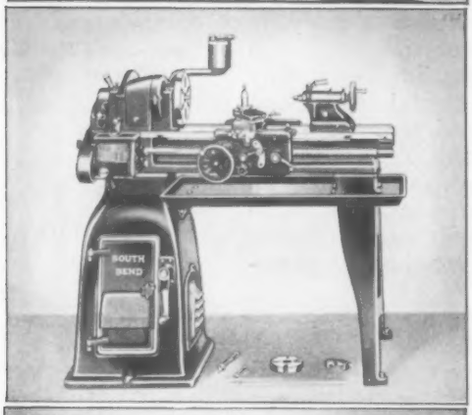
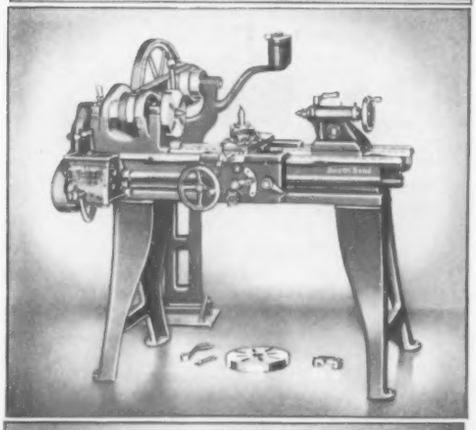
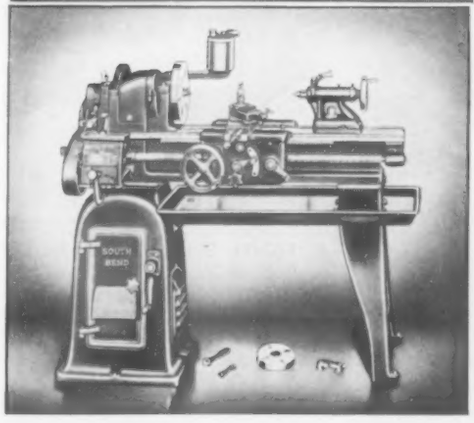


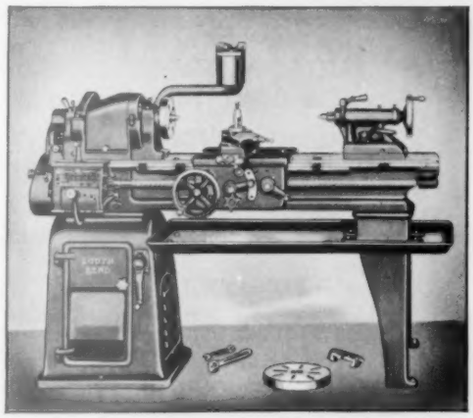
No. 109-Y, 9″ x 3′ Quick Change Gear, Underneath Belt Motor Driven Precision Lathe with ½ H.P. Instant Reversing Motor, Chip Pan, and electrical equipment, as shown. Wt. 810 lbs. **$470.00**



No. 911-A, 11″ x 4′ Quick Change Gear, Pedestal Adjustable Motor Driven Precision Lathe with ½ H.P. Instant Reversing Motor, and electrical equipment, as shown. Wt. 863 lbs. **$528.00**



No. 111-A, 11″ x 4′ Quick Change Gear, Underneath Belt Motor Driven Precision Lathe with ½ H.P. Instant Reversing Motor, Chip Pan, and electrical equipment, as shown. Wt. 980 lbs. **$612.00**



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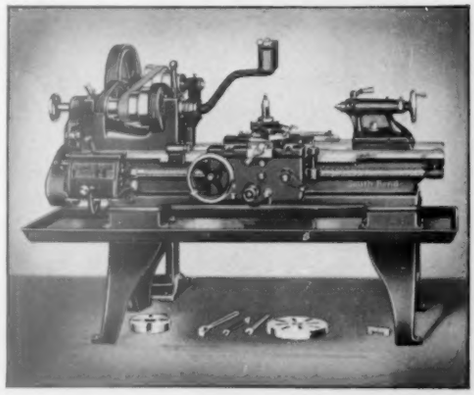

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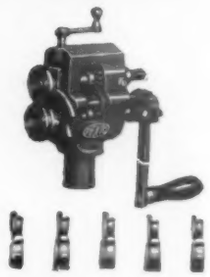

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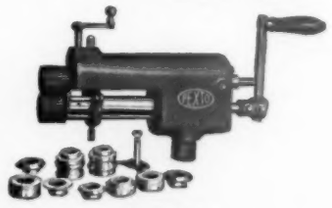

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SECTION XII
TRANSPORTATION SERVICE

PUPIL TRANSPORTATION IN OHIO

By C. D. HUTCHINS

Supervisor of Transportation of the State Department of Education

and

T. C. HOLY

Ohio State University

THE study here briefly reported has been under way since July, 1936. In the School Foundation Program Law enacted June 12, 1935, there is this provision relating to the cost of transportation:

> (d) For districts in which transportation of pupils is necessary, an amount equal to the approved cost of such transportation service, which shall be in addition to the amounts specified in paragraphs (a) and (b) or (c) of this section.[1]
>
> The director of education shall prescribe regulations governing methods and means of transportation and shall make recommendations as to the cost of foundation programs for pupil transportation in districts in which transportation is deemed necessary. The effects of sparsity of population and of other conditions reasonably beyond the control of the board of education of the school district shall be considered in the determination of such transportation costs. The costs of transportation in all instances shall be determined and fixed by the local boards of education, but not to exceed that recommended by the director of education.[2]

As a result of this provision, the state of Ohio during the past year, 1936-1937, subsidized pupil transportation to the amount of $5,138,353. This money was distributed on the basis of two factors, namely, number of pupils transported and total miles traveled by the buses. Because this method does not take into account kinds of roads, density of pupil population per square mile of area, topography, size, and per pupil cost, this study, with the aid of a WPA project, was undertaken to develop a method of distribution which did take these and other factors into account. Before, however, taking up the presentation of the study, a brief statement of the present status and significant factors in pupil transportation are given here.

[1] These paragraphs indicate the Foundation Program's guarantee for kindergarten, elementary and high-school pupils.

[2] Subsection (d) of Section 7595-1c. Ohio School Laws.

Present Status and Significant Factors in Pupil Transportation

The proportion of the cost of education paid from state revenues has been increasing rapidly during the past few years. This shift of the burden from the local district to the state has followed the same trend noticed somewhat earlier in connection with the expenditure for highways.

In 1920 the state funds were supplying 16.50 per cent of the total school income.[3] By 1930 it had increased to 16.94 per cent, and in 1934 the states were providing 23.38 per cent of the total school income in the United States. Ohio has increased its percentage from state sources from 4.3 per cent in 1930 to 56.1 per cent for 1936.[4]

The increase from 16.94 per cent in 1930 to 23.38 per cent in 1934 and the changes since 1934 indicate that the present decade will show a remarkable advance in the per cent of school funds supplied from state sources over that of earlier decades.

Various plans are used for the distribution of state funds to schools. Each state has developed its own particular plan, but there is an obvious purpose, evident in all the plans, to distribute the major portion on the basis of census or attendance, and a smaller portion for specific purposes including equalization, housing, maintenance, pupil transportation and special subjects. The cost of pupil transportation has received special consideration in these plans because it appears to be an extra expense. Some districts must

[3] "Financing Public Education," Research Bulletin of the National Education Association. Vol. XV, No. 1, p. 22.

[4] Holy, T. C., and McKnight, John A.: "Study of Local School Units in Ohio." 1937, p. 96. Ohio State Department of Education.

supply transportation service, while other districts similarly situated with regard to number of pupils, types of school buildings and financial ability, need not consider it. The cost of transportation is truly an extra cost, which justifies the trend toward supplying the greater part of its cost from state sources. An adequate equalization program requires shifting the burden of pupil transportation to the state.

An examination of bulletins and letters received from the various state offices of education reveals a host of plans for the state's sharing the cost of transportation. The principles underlying these methods are somewhat similar, making it possible to establish some degree of classification. Seven typical attitudes, with examples, include:

(1) No state funds for pupil transportation—California, Connecticut, Idaho, Kansas, Kentucky, Louisiana, North Dakota, Oregon, Virginia.

(2) Equalization districts receive some aid on transportation expense—Arkansas, Indiana, Maryland, New Hampshire, Utah.

(3) A low flat rate per pupil is allowed all districts for pupil transportation—Massachusetts, Texas, Wisconsin.

(4) The cost, but not exceeding some maximum, is allowed from the state fund—Michigan, Missouri, Ohio, Florida, Massachusetts.

(5) A fixed per cent of the cost of pupil transportation is allowed to each district—New Jersey, New York, Montana, Mississippi.

(6) Some factors closely related to the cost of pupil transportation are recognized in determining the cost which is recommended and paid from the state fund—Alabama, Minnesota, Oklahoma, South Carolina, Washington.

(7) The state fund pays the full cost and supplies a state program of pupil transportation—Delaware, North Carolina.

The seven classifications have been arranged in the historical order. Generally, states have gradually moved from the status of supplying no state funds for transportation, through various plans of allowing constantly increasing amounts, toward some method of paying almost the entire cost of pupil transportation from the state fund. Principles of equalization indicate that this is a proper trend, and that eventually with more adequate equalization the local school districts will be relieved of almost all the cost of transportation.

The exact proportion of the cost of transportation which should be paid from state revenues is debatable. The percentage is somewhat dependent upon the unit of control. Where local school districts are responsible for the program, probably a large proportion of the cost should be paid from state funds. A small proportion paid from local revenues will encourage local interest in service and economy. Where the transportation service is taken over by the county or the state, the local school district should be relieved of the entire cost.

The payment of a larger proportion of the cost from the state fund requires that the state office charged with the responsibility of distributing the money have some means of determining the right cost of pupil transportation for each district. In considering a proper cost of pupil transportation for any district, it is only natural to inquire about the number of pupils to be transported and the distance they must travel in going to school. These are the two most obvious factors which affect the cost of pupil transportation. Many other factors can also be listed which may affect the cost. An examination of recent bulletins, reports and chapters on pupil transportation supplied a list of seventy factors that probably are associated with the cost of transportation. This list could be extended, if no requirement as to significance were observed.

Some of the seventy factors listed appeared to be less influential in affecting the cost of transportation, and for some others it seemed almost impossible to gather data. Through a process of eliminating those considered to be of less significance and those for which data were not available, the list was reduced. Finally, a list of thirty factors was retained for further scrutiny. As these factors were listed, they appeared to fall definitely into two groups. First, there were those over which the boards of education could exercise little or no control. A second group included those which are largely matters of policy with the board of education. The factors are presented under these two classifications:

A. *Factors Which Are Not Under the Control of the Board of Education*

1. Number of pupils transported
2. Number of vehicles used
3. Prevailing wage scale
4. Total miles per day
5. Daily miles per bus
6. Total one way loaded miles
7. One way loaded miles per bus
8. Area of the school district
9. Density (transported pupils per square mile)
10. Condition of roads (District Reports)
11. Condition of roads (Highway Department)
12. Number of hazards
13. Size of pupils (per cent elementary)
14. Minutes required per bus—A.M.

B. *Factors Which Are Under the Control of the Board of Education*

15. Number of trips per bus
16. Pupils transported per bus
17. Average bus capacity
18. Number of pupils per trip
19. Seating arrangement (per cent facing forward)
20. Per cent of non-useful miles
21. Per cent of bus capacity utilized
22. Average age of buses
23. Average investment per bus
24. Investment per pupil transported
25. Per cent of buses owned by the board
26. Average number of bids per route
27. Liability insurance per pupil
28. Average number of buildings served
29. Number of months of bus service
30. Average term of bus contracts

The proper classification under which the factors should be listed was obvious for most of the thirty, but it is to be recognized that some of them were difficult to classify. Those arousing questions concerning the possibility of being controlled or not controlled by the boards of education were:

2. Number of vehicles used
4, 5, 6, 7. Miles of bus travel
14. Minutes required per bus—A.M.

15. Number of trips per bus
16, 17, 18. Size of bus
28. Average number of buildings served

NUMBER OF VEHICLES USED

The number of vehicles used (factor 2) appears at first to be under the control of the board. Three 50-passenger buses might be employed, or the board could decide to use six 25-passenger buses. Abstractly, this seems to be under control, but when any actual district situation is being studied, the number of pupils to be transported, the condition of the roads and the number of good roads leading to the school definitely indicate the right number of buses. In an occasional district the board may reasonably employ six larger buses to replace seven formerly used, or the board may replace a program of transportation by parents with a school-bus system, reducing the number of vehicles, but in most school districts in Ohio the proper number of modern school buses to be used is quite obvious. It is fixed by conditions that are not under the immediate control of the board of education. Thus this factor is classified as being beyond the control of the board of education.

MILES OF BUS TRAVEL

The four factors relating to miles of bus travel (4, 5, 6, 7) are placed in the group with other factors which are not controlled by the board of education.

A reasonable doubt as to this classification seems justified when we consider actual situations where buses are routed inefficiently. Instances of straight-line routing, unnecessary overlapping, dead-ending and retracing indicate that the miles driven can be controlled. However, generally all the miles of passable roads in any district must be traveled, and there is an obvious attempt to have these roads traversed once. Thus, the chief controlling factor which determines the miles of travel is the number of miles of passable road in the district. This is not under the control of the board of education, but is a feature of the situation which exists. The factors relating to miles of bus travel are therefore considered as chiefly beyond the control of the board of education.

MINUTES OF BUS SERVICE

Similarly, the number of minutes of bus service (factor 14) being a function of miles of travel and speed, is classified as beyond the control of the board of education. The miles of road exist and must be traveled, and public opinion controls the speed. Public opinion also requires the board to obtain a reasonable amount of service from each bus. In a densely settled district where one trip can be made in ten minutes, the board is compelled to arrange additional service to justify the investment in the service. Thus, the number of minutes of service is recognized here as chiefly beyond the control of the school authorities.

NUMBER OF TRIPS PER BUS

While it is recognized that second and third trips (factor 15) are impracticable in some districts, still it seems preferable to list this item as one which is under the control of the board of education. Most rural districts in Ohio provide transportation for children living more than one mile from school. School buildings are generally located in the most densely populated portion of the district. Thus, it is often feasible for the bus to make a long first trip gathering pupils from outlying sections, and then to make a short second trip to a point about two or three miles from the building to provide additional service. Since the board may or may not plan additional trips, it is being recognized here as under the control of the board of education.

SIZE OF BUS

The three factors related to the size of the bus (16, 17, 18) are classified as under the control of the board. Exceptions are to be noted where the service required by the situation implies a certain size of vehicle, yet even here the board might permit overcrowding a small bus or partial use of too large a bus and operate a vehicle of unsuitable capacity.

AVERAGE NUMBER OF BUILDINGS SERVED

The average number of buildings served by a bus (factor 28) is obviously affected by the number of buildings existing in the school district. Thus, districts having only one building have little control over this factor. However, where several buildings are operated, the boards are able to create a system of transportation for each building, or they may route the buses so they can transport pupils to more than one building. The rapid enlargement of districts and the tendency to think of a county system of transportation emphasize the wisdom of including this factor as one under the control of the boards of education.

The factors suggested under A and B were separated into controllable and non-controllable groups, prior to testing their relationships to the costs per pupil per month. The uncontrollable factors were to be used to indicate a proper cost of transportation for each district, and the controllable factors to give

evidence concerning the bearing of factors of management upon cost. From such considerations it would seem possible to distribute a state fund for pupil transportation on the basis of the more significant factors which are beyond the control of the boards of education. In order to obtain an optimum condition with regard to management, the relationships existing between the cost of pupil transportation and the managerial factors could serve as a basis for adjusting the basic cost for each district previously determined by the uncontrolled factors. Thus, by recognizing the uncontrolled factors closely related to the cost of transportation, the State Department of Education could calculate a right amount for each district. This amount could then be further adjusted to the local district program through increments and deductions awarded for several significant factors of management. The adjustments might be regarded as rewards and penalties for desirable and undesirable policies of management, but chiefly they should be considered as corrections essential to the determination of a cost which is fitted to the program established by the local school district.

The Ohio Study of Pupil Transportation

The suggestions considered here were actually applied to the data for 7,366 of the 7,519 school buses which operated in Ohio during the 1936-1937 school year. By correlating the fourteen factors not controlled by the boards of education with the cost per pupil per month, and by studying essential partial correlations, three factors were found to be of overwhelming significance in determining the cost of pupil transportation. These factors are:

(1) Number of pupils transported (the larger the number, the less the cost per pupil)
(2) Density (transported pupils per square mile)
(3) The condition of the roads

A regression equation [5] was then evolved which would be useful in calculating a proper cost per pupil per month for any school district, on the basis of data relating to these three factors. The resulting equation is:

$$C = 5.1369 - 1.6402 \text{ (Log P)} - .0135 \text{ D} + .0064 \text{ R}$$

in which

C = calculated cost per pupil per month
P = number of pupils transported
D = density (transported pupils per square mile)
R = index of road condition. (The per cent of miles of hard-surfaced road, plus two times the per cent of gravel miles, plus three times the per cent of earth miles. Range 100 to 300.)

The application of this formula to the data for the 1,458 school districts used in the study resulted in calculated costs which when correlated with the actual costs for 1936-1937 yielded +.662 as the coefficient of correlation.

The 1,458 variations between actual and computed costs were then correlated with the sixteen factors of local management, to determine which factors were closely associated with the variations and which might therefore be recognized as causing the actual cost to differ from the calculated cost. A study of these correlation tables as well as several essential partial correlations revealed that seven of the sixteen managerial factors were quite worthy of being used as bases for adjusting the costs per pupil per month determined by the formula. These factors are:

1. Pupils transported per bus
2. Average investment per pupil
3. Number of trips per bus
4. Seating arrangement (per cent facing forward)
5. Per cent of bus capacity used
6. Average number of bids per route
7. Per cent of buses owned by the board

The adjustments to be made to the calculated cost per pupil per month for each of the seven factors related to management are presented in Tables 1 to 7.

The adjustments listed in the seven tables were applied to the data for the 1,458 districts and the final adjusted computed costs per pupil per month correlated with the actual costs. The coefficient of correlation was found to be +.755, which is quite significant. It might be increased a small amount by introducing a few more factors which are related to the cost of transportation, but the increase would be so slight that the improvement would be almost negligible. The seven most significant managerial factors have been used.

If the coefficient is considered too low for a satisfactory prediction of cost figures for use in the distribution of state funds, it can be pointed out that it is low because boards of education in Ohio do not permit uncontrolled factors, including number of pupils transported, density and condition of roads, to have their full effects upon the cost of pupil transportation, and they do not fully manage the controllable factors in such a way as to obtain the best transportation system for the available money. The correction of this situation constitutes the chief value of the present plans. It should also be pointed out that the coefficient of correlation may be low because of the inaccuracies in the reports of transportation costs. At the close of the study the clerk of one board of education indicated that his report was incorrect since he had reported the wage paid the bus driver as the full cost of transportation and had not included any of the other operating expenses. No procedure could be evolved which would predict accurately what some clerks will report.

[5] Wert, James E.: "Educational Statistics." Planographed. Ohio State University, 1935. p. 75.

ADJUSTMENTS FOR NUMBER OF PUPILS TRANSPORTED PER BUS

Number of Pupils per Bus	Adjustment
120 up	— $.91
110-119	— .87
100-109	— .80
90- 99	— .72
80- 89	— .64
70- 79	— .54
60- 69	— .44
50- 59	— .31
40- 49	— .18
30- 39	.00
20- 29	+ .19
10- 19	+ .40
0- 9	+ .64

Table 1

ADJUSTMENTS FOR AVERAGE INVESTMENT PER PUPIL

Average Investment per Pupil	Adjustment
$90 up	+ $.20
80-89	+ .19
70-79	+ .17
60-69	+ .14
50-59	+ .11
40-49	+ .08
30-39	+ .02
20-29	— .04
10-19	— .12
0- 9	— .21

Table 2

ADJUSTMENTS FOR SEATING ARRANGEMENT

Per Cent of Seats Facing Forward	Adjustment
100 up	+ $.13
90-99	+ .11
80-89	+ .10
70-79	+ .09
60-69	+ .07
50-59	+ .05
40-49	+ .03
30-39	+ .01
20-29	.00
10-19	— .03
0- 9	— .05

Table 4

ADJUSTMENTS FOR PER CENT OF CAPACITY USED

Per Cent of Capacity Used	Adjustment
150 up	— $.12
140-149	— .10
130-139	— .08
120-129	— .06
110-119	— .04
100-109	— .02
90- 99	— .01
80- 89	+ .01
70- 79	+ .02
60- 69	+ .03
50- 59	+ .04
40- 49	+ .05
30- 39	+ .06

Table 5

ADJUSTMENTS FOR PER CENT OF SCHOOL BUSES OWNED BY BOARD

Per Cent Owned by Board	Adjustment
100 up	— $.08
90-99	— .08
80-89	— .07
70-79	— .06
60-69	— .06
50-59	— .05
40-49	— .03
30-39	— .02
20-29	— .01
10-19	+ .01
0- 9	+ .03

Table 7

ADJUSTMENTS FOR NUMBER OF TRIPS PER BUS

Average Number of Trips per Bus	Adjustment
3.40 up	— $.26
3.20-3.39	— .25
3.00-3.19	— .23
2.80-2.99	— .21
2.60-2.79	— .19
2.40-2.59	— .17
2.20-2.39	— .14
2.00-2.19	— .11
1.80-1.99	— .08
1.60-1.79	— .06
1.40-1.59	— .03
1.20-1.39	.00
1.00-1.19	+ .04

Table 3

ADJUSTMENTS FOR AVERAGE NUMBER OF BIDS

Average Number of Bids	Adjustment
2.40 up	— $.16
2.00-2.39	— .15
2.00-2.19	— .14
1.80-1.99	— .13
1.60-1.79	— .12
1.40-1.59	— .10
1.20-1.39	— .09
1.00-1.19	— .08
.80- .99	— .06
.60- .79	— .04
.40- .59	— .02
.20- .39	.00
.00- .19	+ .02

Table 6

The practice of bidding also reduces the accuracy with which any plan of calculation can reproduce the actual cost. In one instance a driver regularly presents a bid for about one-half the reasonable cost. He argues that he can do it for less because he doesn't need to buy gasoline and oil. His wife milks twelve cows, sells the cream, and pays the bill at the filling station.

Another significant consideration which causes the variation between computed and actual costs, is that the employment of bus drivers is occasionally regarded as patronage. Board members may attempt to repay friends by awarding them bus-driving jobs at higher wages than are necessary or reasonable. On the other hand, some bus drivers offer to work for unreasonably low wages under an unfriendly administration, rather than give up the employment and dispose of the school bus at a sacrifice.

Personalities enter into the determination of the cost of transportation. Therefore, we cannot hope to predict perfectly the cost of transportation in all school districts. Any scheme which produces cost figures correlating with the actual figures as high as +.755 is extremely useful. In fact it may be inferred that the calculated costs are the right costs and that those presented by the various districts are affected by considerations which the state should not finance. This implies that the computed amount is reasonable, and that the amount spent in each district can be adjusted to the figure recommended by the state, without producing inadequate or unsafe transportation service.

The use of this proposed plan of determining the right cost for each district as a basis for the distribution of state funds is presented in the following example:

Essential Data Required from School District

To apply the basic formula:

1. Number of pupils entitled to transportation	374 pupils
2. Number of square miles in the school district	39 sq. mi.

To apply adjustments for policies of management:

1. Number of vehicles used	10
2. Present value of school bus equipment	$8,274
3. Total number of trips	13
4. Total feet of seating space (484)	
Forward-facing seats	280 ft.
Longitudinal seats	204 ft.
5. Number of buses owned by board	4
6. Total number of bids received prior to signing the transportation contracts	14

In addition to the data obtained from the school district, it is necessary to obtain three other figures from the State Department of Highways, regarding the condition of the roads. These figures include the number of miles of road which are considered as having a hard surface, the number of miles of improved gravel roads, and the number of miles which are unimproved. The total of the per cent hard surface, plus twice the per cent gravel, plus three times the per cent unimproved is taken as 223 in the example.

The application of the plan can be illustrated from the data given for the items listed above which might be reported for some school district:

SUMMARY OF ADJUSTMENTS FOR POLICIES OF MANAGEMENT

Policy	Status	Refer to Table	Adjustment
Number of pupils per bus	37.4	1	+ .00
Average investment per pupil	$22.12	2	— .04
Number of trips per bus	1.3	3	— .00
Seating arrangement (% FF)	57.8%	4	+ .05
Per cent of capacity used	65.1%	5	+ .03
Average number of bids	1.4	6	— .10
Per cent of buses owned by board	40.0%	7	— .03
Total of adjustments			— .09

Table 8

BASIC FORMULA

$C = 5.1369 - 1.6402 (\text{Log } P) - .0135 D + .0064 R$

in which

C = computed cost per pupil per month
P = number of transported pupils
D = density
R = index of road condition

Substituting specific values

$C = 5.1369 - 1.6402 (2.5729) - .0135 (374 \div 39) + .0064 (223)$

$C = 5.1369 - 4.2201 - .1295 + 1.4272$

$C = 2.2145$ (cost per pupil per month)

After the cost per pupil per month is calculated from the formula, the plan proposes that this basic figure be further adjusted to care for managerial policies. The seven adjustments for these policies are given in Table 8.

Total adjustments	— .09
Basic amount	+ 2.2145
Computed allowance per pupil per month	$2.1245
Number of pupils	374
Amount per month	$794.563
Months	9
Amount for year	$7,151.07

The $7,151.07 computed by this plan is then to be recognized as the proper amount for transportation expense in this district for one year. It amounts to $19.12 per pupil per year, which is above the average of $18.43 determined for the entire state of Ohio for the 1936-37 school year.

The application of the proposed procedure to data for 1,458 districts of the 1,534 school districts in Ohio having pupil transportation programs, brought out certain advantages over other plans previously described. Probably the most important gain is in the

accuracy with which it permits establishing a correct cost of pupil transportation for each district. Usually a few factors, including number of pupils, distance traveled and length of the school year, are partially considered and a meager allowance from the state fund made in recognition of the transportation expense. The proposed use of three factors, beyond the control of the board of education, and seven additional factors of management, would permit ten considerations to have their proper effects upon the computed costs. The resulting figure, having been adjusted for the ten most significant factors, is accurately fitted to the local program of transportation and at the same time has within it influences penalizing unwise management and encouraging economical, efficient and desirable policies of management.

Another advantage noted in applying this procedure is the small amount of data needed from the school districts and the simple method of calculating the right cost for each district. The amount of work required is probably much less than is found in many states under existing plans of administering the transportation program.

The procedure also encourages local responsibility. There is a strong tendency for boards of education to turn over much of the responsibility for the transportation program to the State Department of Education in those states which supply a large part of the cost from the state fund. Board members indicate a willingness to accept whatever program of transportation the state can finance. This attitude is not wholesome and usually is accompanied by less efficient transportation service and increased cost. The procedure suggested here produces an annual cost for the school district. It is then the duty of the local board of education to establish a transportation system, to determine the amount to be paid for all items of service, to organize the routes and to otherwise administer the local program. Districts in which the demands made by the community require a superior transportation service will expect to make an additional contribution from local revenues to the extent that the cost exceeds the right amount as computed by the method outlined. Boards of education will need to assume greater responsibility and will not be able to refer protesting patrons and unsatisfied contractors or bus drivers to the state departments of education. The local school officials are fully informed concerning such grievances and are responsible for an efficient local administration.

A further advantage of the proposed method is its flexibility. The ten factors used here need not be considered as the most useful factors under all conditions. Data obtained from other states might require the use of a different number and different factors. Also, the factors used can be varied whenever conditions indicate that some other item needs emphasis. The department of education finding that some trend in local management is undesirable can establish the item as a new factor, and determine deductions and increments which will discourage the trend and encourage the opposite. The total amount spent for transportation will not be changed, since the total of all the increments and deductions for any factor of local management is held at zero. Thus the flexibility of this plan, making it possible for the state department of education to move forward in its effort to obtain safe, comfortable, economical and efficient pupil transportation, establishes the technique as superior to methods generally found in use.

DESIGNING SCHOOL BUSES FOR SAFETY

By W. H. CAMERON

Managing Director, National Safety Council

MOTOR-BUS transportation of school children has rapidly become a major problem. From an estimate of some 51,000 motor-buses used in 1933 to transport 2,000,000 children daily, the figures climbed to 80,000 buses and 3,000,000 children for the school year 1936-37.

There can be no more important consideration than responsibility for the safety of these children. This responsibility rests primarily in the local school board or a delegated officer, such as the superintendent, except in those states which by statute have given the state department of education this duty. The National Safety Council has recommended that legislatures enact laws empowering the state superintendent of public instruction to establish general bus equipment standards and operating practices to insure uniformly safe operation.

The superintendent should develop detailed rules and regulations in cooperation with the state commissioner of motor vehicles; or, if there is none, with the state highway commission. To aid the local authorities to carry out the orders of the state superintendent of public instruction, help should be asked of the school principal, the teachers, the school-bus patrols, and the children themselves. Where laws specifying equipment standards and operating practices already exist, the schools should in all cases comply with the legal requirements.

The National Safety Council also recommends that the state legislatures pass laws requiring automobile drivers to decrease their speeds to not over ten miles per hour when approaching and passing a school bus which is stopped to take on or let off passengers. This also is a recommendation of the Uniform Vehicle Code as formulated by the National Conference on Street and Highway Safety.

Children are required by law to attend school until they reach a certain age, and many schools, particularly consolidated schools in rural areas, are located a long distance from the homes of many pupils. It is logical, then, to expect school authorities to provide for their transportation, and that, moreover, this transportation should be safe. Whether the bus is owned by the school board or whether it is contracted for by the board, it should meet certain definite safety requirements. When the bus is contracted for, these requirements should be specified in the contract, which should also provide for the proper upkeep of the vehicle.

Before entering into a specific discussion of safety design, however, it should be pointed out that the mechanical equipment of the school bus is but one of the factors that must be considered in the safe transportation of school children. These factors include: (1) safe drivers; (2) safe equipment; (3) safe practices on the part of drivers and pupils; (4) safe routes of travel; and (5) wise administration and supervision.

The Competent Driver

It is impossible, of course, to discuss all these factors here. All of them are important; none can be neglected without endangering the whole plan of safe transportation. Yet I cannot refrain from emphasis upon the selection, training and discipline of the driver. It has often been said that a broken-down car on a hazardous road might escape accidents if the vehicle were driven by a competent driver. But it is equally evident that the best of vehicles upon a good road may meet with disaster if it is driven by a reckless, stupid and incompetent person. No school bus can be safer, then, than the driver who operates it. The school authority charged with this responsibility will neglect no possible means of determining that the driver he selects is competent and wholly sensible of his own responsibilities.

Marking of Bus Body

The bus should have SCHOOL BUS signs (black on yellow) with letters at least 6 inches high on both front and rear and also on the two sides of the bus; a means should be provided for covering or removing these signs whenever the bus is not in use as a school vehicle. All school buses should be painted a standard lemon-yellow color with dark contrasting fenders, so that in all parts of the country they may be readily recognized. This coloring is recommended because the lemon-yellow reflects a very large percentage of light, making the bus easily seen and also providing a contrast against a black background, such as a dark sky; and the dark fenders give additional contrast against white backgrounds, such as snow banks.

Size of Bus—Ventilation—Heating

The size of the school bus will be determined, in large measure, by the number of pupils it is expected to carry. The bus chassis should be especially built

for the transportation of people; that is, it should be a motor-coach chassis. This will give the chassis sufficient strength with a low center of gravity that will make it less liable to tip than a truck. It will also provide greater comfort and prove economical in the long run. Makeshift bus equipment is a decided hazard and a poor investment.

The bus should never be required to carry a load exceeding that which has been prescribed by the manufacturers. Likewise, it should conform with such regulations as have been established by the Department of Public Instruction, Motor Vehicle Department, Public Service Commission, or other state body exercising control over passenger-carrying vehicles.

It is not generally recommended that a 1½-ton chassis be used for buses with a seating capacity in excess of 35 children; or a 2-ton chassis for a bus seating more than 50 children. No more than 60 children should be carried in any school bus except in very unusual circumstances. The inside height of the bus body should be not less than 60 inches, and possibly a higher minimum than this should be provided if high-school children are transported.

Buses should be equipped with approved roof ventilators, but generally these need to be supplemented by ventilation of some other form, especially for long hauls with few stops. The windows should be so designed that they can be opened for ventilation without admitting rain or snow. Forced ventilation through the use of a fan at the rear of the bus is recommended if practical from a cost standpoint. Every school bus should be adequately heated when necessary. Heaters may be of hot-air or hot-water types, or exhaust heaters if these are carefully and thoroughly guarded to prevent the escape of carbon monoxide gas into the interior of the bus.

The Driver's View

Safety glass should be used in the windshield and in all doors and windows. The lower part of each side window should be provided with metal gratings or cross-bars.

The windshield should provide a wide angle of vision, and be large enough in its vertical dimension so that the driver can see the road immediately ahead of the bus. The glass in the windshield as well as in all the windows should be of good quality to provide the driver with an undistorted view in any direction.

The bus should be equipped with an adequate power-driven windshield wiper (capable of manual operation in case of emergency), a sun visor and a rear-vision mirror. This mirror should be at least 3×12 inches and should give the driver a clear view of the interior of the bus and the highway to the rear and on both sides. An additional rear-vision mirror should be provided on the outside of the bus at the driver's left, if the body construction toward the rear is such as to produce "blind spots."

The bus should be constructed so that the front corner posts will not be so wide as to constitute "blind spots" in the driver's vision. The body posts and top should be of sufficient strength to protect the children in the event that the bus turns completely over.

Bumpers—Guard-Rails

Substantial bumpers should be anchored on the chassis at both the front and rear of the bus. The bumper on the rear end should be so constructed and guarded that hitching will be difficult if not impossible, and there should not be any grab-rods or handles on the outside of the bus that children might ride or hang on.

Guard-rails of ample strength should be provided to resist the impact of other vehicles and to prevent the side of the bus from being crushed in case of accident, as well as to provide a rub-rail for protection in case of side-wiping. These rails should be located at the seat line for maximum protection of the passengers and should be of one piece extending from front to rear of the bus on both sides.

Courtesy The Bender Body Company

A school bus clearly identified by name and contrasting colors, and showing full-vision windshield with dual wipers, roof ventilators, side reflectors and wide service door with lower panel safety glass

The Bus Doors

The service door is usually placed at the front end of the bus, opposite the bus driver; it should be under his control and so constructed that it will not open if children lean against it. This door should give a minimum clear opening of 24 inches. Suitable steps, the first one not over 10 inches from the ground, and with risers not exceeding 10 inches, should be provided. These steps should be enclosed to prevent the accumulation of snow and ice. Hand-rails should be provided at entrance doors, and these should be low enough for the smaller children to grasp.

Front service door located opposite driver, showing inclosed, non-skid safety step, folding door, step light and hand-rails

In some types of buses the service door is located in the center of the right side of the bus. In such cases it is under the control of a "conductor," usually an older pupil who may receive some small remuneration for his service. When this system is in use, the conductor should take care to inform the driver whether he has stopped the bus at a suitable place for the children to board or alight; and he should also help the driver to ensure safety at railroad crossings, if necessary.

It may be desirable to provide a glass window in the lower panel of the service door so that the driver can see the children waiting to enter the bus and also see the ground at the right of the bus. This will help him to avoid stopping at chuck-holes and other places where it would be difficult for the children to alight; it will also enable him to see that the children are not in the way when the door is opened or closed. This window should be no larger than is absolutely necessary to give an adequate view, and only heavy plate safety glass of a laminated or wire-reinforced construction should be permitted. The door jambs should be equipped with channels or rubber hose as protection against crushed fingers.

The bus should have no door on the left-hand side of the driver, because such a door can serve no essential purpose and it would weaken the construction of the bus body.

Every school bus should be provided with an emergency door located in the rear end of the bus or at the rear of the side opposite the service door. The following specifications should be observed:

(a) It must give a minimum horizontal clearance of 18 inches.

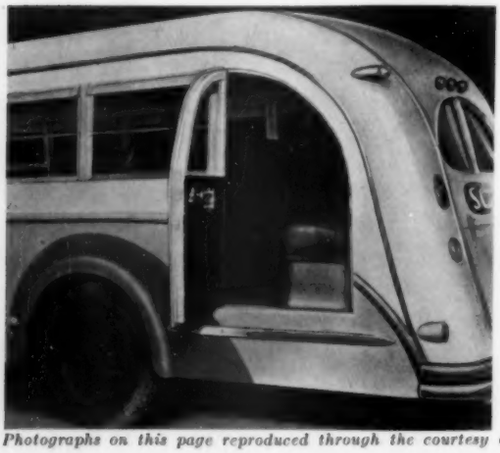
(b) It must give a minimum vertical clearance of 48 inches.

(c) It must be conspicuously marked on the inside with the words EMERGENCY DOOR.

(d) It must be provided with a fastening device which can be quickly released in case of emergency, but which is protected against accidental release. This release should not be under the control of the driver. Such control would involve a complicated linkage between the fastener and the driver's seat, which might easily become jammed if the bus were involved in an accident, thus making the door inoperative at a time when most needed. This emergency fastening device should be tested at frequent regular intervals.

(e) There should be no steps to the emergency door.

(f) Buses must be so constructed that no obstruction will prevent the movement of passengers to and through the emergency door. An aisle at least 12 inches wide should lead to this door and be kept free from packages or luggage at all times.



Emergency exit and safety latch on opposite side of bus from front service door

Rear view of a well-marked bus with two large diameter stop lights, turn indicators, identification, tail and clearance lights

Photographs on this page reproduced through the courtesy of the Rex-Watson Corporation

Courtesy of Penn Yan Bodies

Four modern school buses used in the city of Buffalo, N. Y.

The Lights

Electric lights should be provided for the interior of the bus, which should be turned on whenever the headlights are turned on, and the bus steps should also be provided with adequate light.

In addition to the regular tail-light on the rear of the bus, a red button type reflector should be placed on the extreme left rear corner of the bus and, preferably, also at the right rear corner, at the level of approaching automobile headlights.

It is recommended that a semaphore or light signal flashing STOP be placed on the rear of those buses operating in states which have laws requiring that all cars stop at standing school buses.

The Seating

There should be in each school bus a minimum lineal seating allotment of 13 inches for each grade-school pupil, and of 15 inches for each high-school pupil; these measurements should be used for determining the capacity of seats designed for more than two passengers. When a bus is purchased, it should be selected with a greater seating capacity than may be needed at the time, to provide for an increase in the school population. Seats for high-school students should be at least 14 inches deep, and for grade pupils at least 12 inches deep. All seats should have spring cushions.

There should be a comfortable seat for every passenger, but if this is impossible for the full length of the route, substantial handholds should be provided for those who must stand temporarily. If children stand in an aisle with others sitting on both sides, the aisle should be at least 20 inches in width. If no passengers stand, the minimum aisle width may be 15 inches, with seats on both sides, or 10 inches, with seats on one side. All seats should be securely fastened to the bus structure, and under no circumstances should extra seats of any kind be placed in the aisles or passageways.

Fire Protection

The gasoline tank should be located, filled, drained and vented outside the bus body.

Every school bus should be equipped with a fire extinguisher, which should be located near the driver's seat, and he should be familiar with its operation and the care necessary to keep it in condition. The carbon tetrachloride type of extinguisher in the one-quart size or larger is recommended, and two of these should be provided for the larger buses. The second extinguisher should be located on the rear wall of the bus. They should be checked periodically to see that they are full and in working order.

Other Safety Essentials

The Section of Safety, Bureau of Motor Carriers, Interstate Commerce Commission, Washington, D. C., recently brought out a series of "Safety Rules and Regulations" which merit the consideration of all school-bus operating groups. Although developed specifically for the contract haulers and common carriers engaged in interstate commerce, these recommendations are both practical and desirable in the interest of standardization.

Each school bus should be equipped with a set of skid chains, and the driver should be required to use them in slippery weather.

Each bus should be provided with a first aid kit, and the driver should be instructed in first aid.

Every bus should be equipped with warning flags to be set in front, to the rear and at the side of the bus when, because of a breakdown or any other reason, it remains standing on the highway for any appreciable time. Buses used at night should also be equipped with flares or warning lights for this purpose. The driver should be familiar with all regulations and ordinances with reference to parking along the highways and the use of parking flares.

The bus should be cleaned once a day and washed with a disinfecting solution at least once a week.

Inspection

Every school bus should be inspected at least once a week by competent mechanics who will check the headlamps and tail-lights, the brakes, the steering apparatus, tires, emergency door, windshield wiper, horn, speedometer and all other mechanical features. In addition, the driver himself should be required to make a personal check of all these mechanical items every time he takes the bus out for service. If any mechanical defect appears, especially with reference to brakes, tires, or the perfect handling of the vehicle, he should immediately have the necessary repairs made.

It will be noted, of course, that in this outline of the safe design of school buses no specific references have been made to quality or strength of materials. Nor is there any discussion of the relative merits of combination wood and steel and all-steel bodies, nor of the type or power of engines, nor of other similar engineering problems.

Doubtless it may be agreed that these matters are likely to be most capably handled by the manufacturers of the best types of school vehicles. It should suffice for the purchasing agency employed by the school organization to select a manufacturer of known integrity in the production of high-class and standard vehicles, and to provide in his contract specifications that the safety features outlined here shall be fully met.

Safety may be built into the school vehicle with all sincerity; it may be provided without stint in the equipment; the mechanical efficiency of the vehicle may be kept in perfect repair; yet, as I have already pointed out, if the performance of the driver is lax in any serious respect, all this vaunted mechanical perfection and the innocent child passengers may become a mangled mass of waste and wreckage on the highway. Safety, therefore, should be a matter of supreme importance to the highest school authority, and his responsibility is never ended until each night the bus has completed its course and its precious freight is safely housed beyond the lighted windows of the community's homes.

SCHOOL BUS INSPECTION REPORT

School District _____ County _____

Owner _____ Address _____

Driver _____ Address _____

Inspected by _____ Date _____

Make and year _____ License number _____

	Yes	No	Remarks
Speedometer (Mileage)			
Foot Brakes			
Emergency Brakes			
Steering Mechanism			
Tires			
Spare Tires			
Headlights			
Rear Lights			
Clearance Lights			
Auxiliary Lights			
Stop Lights			
Signal Device			
Reflectors			
Rear View Mirror			
Windshield Wiper			
Clutch			
Springs			
Muffler			
Exhaust Pipes			
Gasoline Tank			
Horn			
Drivers View			
Doors			
Emergency Exit			
Steps			
Glass			
Seats (firmly fastened)			
Handrails			
Floor			
Interior (clean)			
Interior Lighting			
Heating System			
Ventilation			
Top			
Signs			
Skid Chains			
Fire Extinguishers			
First Aid Kit			
Tools			

Instructions: If equipment meets the governing laws and regulations place check in column headed "yes"; and in column headed "no" if equipment is below requirements. Use column headed "Remarks" for additional explanation.

Suggested bus inspection report

Care in loading and unloading of buses is an important factor in accident control. Here the School Boy Patrol, organized by the Delaware Safety Council and the Police Department, supervise the loading of a school bus at the Du Pont School, Wilmington, Del.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)

180 No. Michigan Ave. Chicago, Illinois

Insist on INTERNATIONAL SCHOOL BUSES

They're SAFE
They're ECONOMICAL
They're DEPENDABLE

The importance of safety, economy, and dependability in school transportation cannot be emphasized too strongly. In building school bus chassis, International Harvester is guided by these fundamentals. Every International school bus chassis combines sound design, sturdy construction, and modern mechanical refinements to provide safe transportation at low cost.

School bus requirements vary with road conditions, lengths of routes, and the number of children to be transported. International chassis are available in standard wheelbase lengths to mount school bus bodies made by any manufacturer. With this coordination of body and chassis, the weight of the buses and the passenger loads are properly distributed between front and rear tires.

Before you invest in school transportation or award hauling contracts, make a thorough investigation and you will see why so many school boards insist on International buses. More than thirty years of experience in the manufacture of quality automotive units is back of Internationals. Service is provided by 237 Company-owned branches and service stations and thousands of International dealers.

Write for the International school bus catalog and for the "School Bus Cost Record"—a simple method of keeping costs on school bus operation and maintenance.

Sturdy chassis and all-steel bodies protect the children

Long wheelbase Internationals for outlying routes

Internationals are safe and economical to operate

Internationals solve school-hauling problems

PENN YAN BODIES

Penn Yan, New York

Announcing
The "PENN YAN" School Bus for 1938

The 1938 "PENN YAN" school buses are a special type of construction of exceptional quality, inherent structural strength and detailed finish. They are sanely engineered for safety and durability.

Distinctive appearance is created by modern streamlined styling, adapted to a construction that has been used by us for many years and has therefore had its durability proved under all conditions of road and terrain.

The "PENN YAN" school buses are a credit in every respect to the highest standards of custom body construction. They are the result of the most perfect blending of engineering and artistry to be found in any motor coach built today. Down to the last small detail, the 1938 "PENN YAN" school bus furnishes a new standard by which all other buses might be measured—for safety, for comfort and individuality.

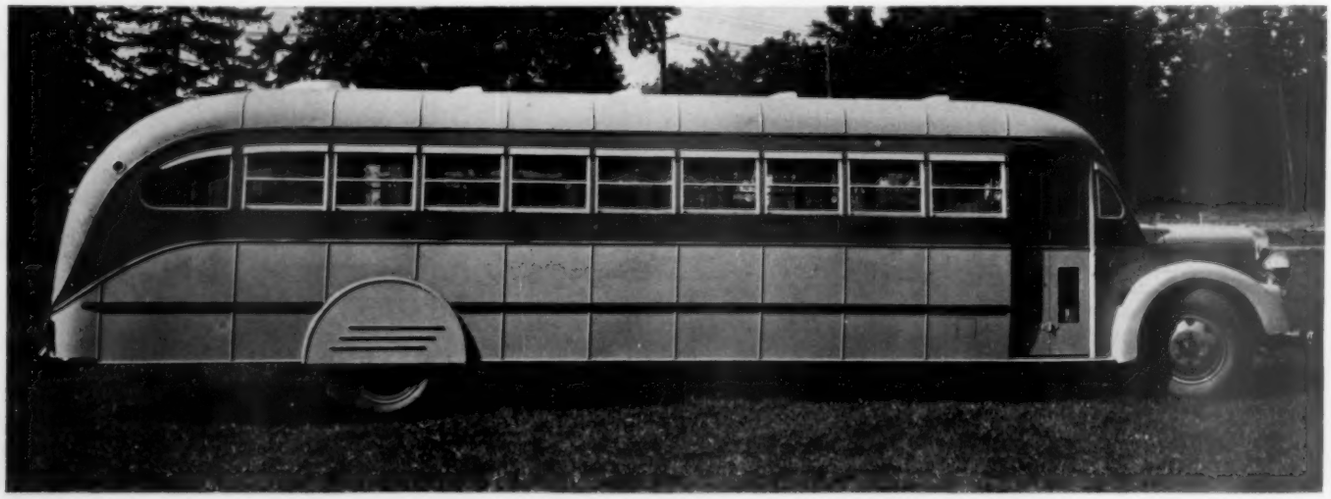
"BUILT TO A STANDARD AND NOT TO A PRICE," "PENN YAN" school buses are delivered completely equipped with all appointments. They have the most flawless execution of interior styling ever found in a school bus, which helps to make this new "PENN YAN" the ultimate in pupil transportation.

Whether your requirements call for 31 or 55 passengers, you will find a "PENN YAN" school bus to meet your most exacting conditions. Various capacities are available consisting of 31, 37, 43, 49, and 55-passenger buses. They can be mounted on any make of chassis selected, provided they meet the requirements of your State Board of Education and Public Service Commission.

"SERVICE" is the keynote of our success. Therefore for a number of years, we have maintained a service car, virtually a factory on wheels, thoroughly equipped to re-paint buses and make minor repairs to them on your premises. The cost is relatively low as we consider this service part of our obligation and willingly cooperate by adjusting our time and service work to suit your convenience as much as possible.

In the interest of humanity, Penn Yan engineers have called upon all their resources to make this, "The Penn Yan," the safest and most healthful School Bus ever offered for pupil transportation.

Experienced School Boards now insist that their most valuable assets, "The Children," be transferred in the safest, most healthful school bus obtainable. Penn Yan School Buses now carry, annually, in New York State, over seven million school children, a trust we cherish highly. We invite you to see our demonstrators which are available by the leading bus chassis manufacturers; ride in them and see for yourself why "Penn Yan" School Buses are symbolical with safe and sane pupil transportation.



REX-WATSON CORPORATION

Manufacturers of Highway—City Service—School Bus Bodies

Canastota, N. Y.

Engineering Dept.

FROM BLUEPRINT TO BUYER

REX-WATSON buses are designed, built and serviced by an organization with 52 years of experience in building QUALITY transportation equipment.

Built to endure the wrecking, racking effects of long, hard miles over all kinds of roads, to provide LOW COST transportation with highest degree of comfort, these buses represent the greatest dollar value in the school bus field.

Rex-Watson buses may be had in either ALL-STEEL or COMPOSITE construction, in a wide range of capacities and seating arrangements.

Each type embraces new features in bus construction. New methods of insulation, ventilation, construction and assembly assure you of the utmost in body for the dollar invested.

Rex-Watson bodies may be seen on the chassis of the leading school bus chassis builders. A ride and inspection of the 1938 Rex-Watson school bus will show the many important features of this body.

Rex-Watson bodies are guaranteed to pass the Board of Education and Public Service rules and regulations of the various States.

In the rapidly changing field of transportation, Rex-Watson has kept abreast of the changes. New equipment, new methods of manufacture, new and modern service facilities—these factors that mean LOW COST PER MILE TRANSPORTATION—suggest

INVESTIGATE BEFORE YOU BUY

SECTION XIII
COLLEGE, UNIVERSITY AND NORMAL SCHOOL PRESIDENTS

(Normal school principals are designated by an asterisk.)

City	Institution	President
Alabama		
Athens	Athens College for Young Women	E. R. Naylor
Auburn	Alabama Polytechnic Institute	L. N. Duncan
Birmingham	Birmingham-Southern College	Guy E. Snavely
Birmingham	Howard College	T. V. Neal
Daphne	State Normal School	D. R. Murphy
Florence	State Teachers College	J. A. Keller
Jacksonville	State Teachers College	C. W. Daugette
Livingston	State Teachers College	N. F. Greenhill
Marion	Judson College	L. G. Cleverdon
Montevallo	Alabama College	A. F. Harman
Montgomery	Huntingdon College	Hubert Searcy
Montgomery	State Teachers College	H. C. Trenholm
Normal	State Agricultural & Mechanical Institute	J. F. Drake
Selma	Selma University	Wm. H. Dinkins
Spring Hill	Spring Hill College	John J. Druhan
Talladega	Talladega College	Buell G. Gallagher
Troy	State Teachers College	Chas. B. Smith
Tuscaloosa	University of Alabama	Richard C. Foster
Tuskegee Institute	Tuskegee Institute	F. D. Patterson
Arizona		
Flagstaff	Arizona State Teachers College	Thomas J. Tormey
Tempe	Arizona State Teachers College	Grady Gammage
Tucson	University of Arizona	Alfred Atkinson
Arkansas		
Arkadelphia	Henderson State Teachers College	J. P. Womack
Arkadelphia	Ouachita College	James R. Grant
Batesville	Arkansas College	John Crockett
Clarksville	The College of the Ozarks	Wiley Lin Hurie
Conway	Arkansas State Teachers College	H. L. McAlister
Conway	Hendrix College	J. H. Reynolds
Fayetteville	University of Arkansas	John C. Futrall
Jonesboro	Arkansas State College	V. C. Kays
Little Rock	Arkansas Baptist College	Sidney R. Tillinghast
Little Rock	Philander Smith College	M. LaF. Harris
Little Rock	St. John's Seminary	James P. Gaffney
North Little Rock	Shorter College	T. M. Greene
Pine Bluff	Agricultural, Mechanical and Normal College	John B. Watson
Searcy	Harding College	George S. Benson
Siloam Springs	John Brown University	John E. Brown
California		
Angwin	Pacific Union College	Walter I. Smith
Arcata	Humboldt State College	Arthur S. Gist
Berkeley	Pacific School of Religion	H. F. Swartz
Berkeley	University of California	Robert G. Sproul
Chico	Chico State College	A. J. Hamilton
Claremont	Claremont Colleges	Russell M. Story
Claremont	Pomona College	C. K. Edmunds
Claremont	Scripps College	Ernest J. Jaqua
Fresno	Fresno State College	F. W. Thomas
La Verne	La Verne College	Ellis M. Studebaker
Los Angeles	College of Medical Evangelists	Percy T. Magan
Los Angeles	College of Osteopathic Physicians and Surgeons	Carle H. Phinney
Los Angeles	Immaculate Heart College	Sister Mary Redempta
Los Angeles	Loyola University of Los Angeles	Charles A. McQuillan
Los Angeles	Occidental College	Remsen D. Bird
Los Angeles	University of California at Los Angeles	Robert G. Sproul
Los Angeles	University of Southern California	R. B. von KleinSmid
Oakland	College of the Holy Names	Sister Mary Austin
Oakland	Mills College	A. H. Reinhardt
Pasadena	California Institute of Technology	Robert A. Millikan, Ch. Exec. Council
Pasadena	Pasadena College	H. Orton Wiley
Redlands	University of Redlands	Herbert E. Marsh, Acting
St. Mary's College	St. Mary's College	Brother Albert
San Diego	San Diego State College	Walter R. Hepner
San Francisco	Golden Gate College	Nagel T. Miner
San Francisco	San Francisco State College	Alex. C. Roberts
San Francisco	University of San Francisco	Harold E. Ring
San Jose	State College	T. W. MacQuarrie
San Rafael	Dominican College of San Rafael	Sister Mary Thomas
Santa Barbara	Santa Barbara State College	Clarence L. Phelps
Santa Clara	University of Santa Clara	Louis C. Rudolph
Stanford Univ.	Stanford University	Ray Lyman Wilbur
Stockton	College of the Pacific	Tully C. Knoles
Whittier	Whittier College	W. O. Mendenhall
Colorado		
Alamosa	Adams State Teachers College	Ira Richardson
Boulder	University of Colorado	George Norlin
Colorado Springs	The Colorado College	Thurston J. Davies
Denver	Denver University	D. Shaw Duncan
Denver	Regis College	R. M. Kelley
Fort Collins	Colorado State College of Agriculture and Mechanic Arts	Charles A. Lory
Golden	Colorado School of Mines	M. F. Coolbaugh
Greeley	Colorado State College of Education	G. W. Frasier
Gunnison	Western State College	C. C. Casey
Loretto	Loretto Heights College	Mother Ann Francis
Connecticut		
Danbury	State Normal College	Ralph C. Jenkins*
Hartford	Hartford Theological Seminary	Rockwell H. Potter, Dean
Hartford	Trinity College	Remsen B. Ogilby
Middletown	Wesleyan University	J. L. McConaughy
New Britain	Teachers College of Connecticut	Herbert D. Welte*
New Haven	Albertus Magnus College	Sister M. Anacletus
New Haven	Arnold College for Hygiene and Physical Education	Webster Stover
New Haven	Berkeley Divinity School	Wm. P. Ladd, Dean
New Haven	Connecticut College of Pharmacy	Curtis P. Gladding
New Haven	New Haven State Teachers College	F. E. Engleman*
New Haven	Yale University	Charles Seymour
New London	Connecticut College	Katharine Blunt
New London	United States Coast Guard Academy	E. D. Jones, Supt.
Storrs	Connecticut State College	Albert N. Jorgensen
West Hartford	St. Joseph College	Mother Maria Francis
Willimantic	Willimantic State Teachers College	George H. Shafer*
Delaware		
Dover	State College for Colored Students	R. S. Grossley
Newark	University of Delaware	Walter Hullihen

City	Institution	President
District of Columbia		
Washington	The American University	Joseph M. M. Gray, Chancellor
Washington	Catholic University of America	Joseph M. Corrigan
Washington	Gallaudet College	Percival Hall
Washington	Georgetown University	Arthur A. O'Leary
Washington	George Washington University	Cloyd Heck Marvin
Washington	Howard University	M. W. Johnson
Washington	National University	Charles S. Hatfield, Chancellor
Washington	Trinity College	Sister Berchmans Julia
Washington	Washington Missionary College	B. G. Wilkinson
Washington	Wilson Teachers College	Edgar C. Higbie
Florida		
Coral Gables	University of Miami	B. F. Ashe
Daytona Beach	Bethune-Cookman College	Mary McLeod Bethune
Deland	John B. Stetson University	Wm. Sims Allen
Gainesville	University of Florida	John J. Tigert
Lakeland	Florida Southern College	Ludd M. Spivey
Tallahassee	Florida Agricultural & Mechanical College for Negroes	J. R. E. Lee
Tallahassee	Florida State College for Women	Edward Conradi
Tampa	University of Tampa	John H. Sherman
Winter Park	Rollins College	Hamilton Holt
Georgia		
Albany	Georgia Normal and Agricultural College	J. W. Holley
Americus	Georgia Southwestern College	Peyton Jacob
Athens	University of Georgia	Harmon White Caldwell
Atlanta	Atlanta-Southern Dental College	S. W. Foster
Atlanta	Atlanta University	Rufus E. Clement
Atlanta	Clark University	M. S. Davage
Atlanta	Emory University	Harvey W. Cox
Atlanta	Georgia School of Technology	Marion L. Brittain
Atlanta	Morehouse College	S. H. Archer
Atlanta	Morris Brown College	W. A. Fountain, Jr.
Atlanta	Spelman College	Florence M. Read
Augusta	Paine College	E. C. Peters
Collegeboro	South Georgia Teachers College	M. S. Pittman
Decatur	Agnes Scott College	James R. McCain
Demorest	Piedmont College	George C. Bellingrath
Forsyth	Bessie Tift College	Aquila Chamlee
Gainesville	Brenau College	H. J. Pearce
Industrial College	Georgia State College	B. F. Hubert
La Grange	La Grange College	W. E. Thompson
Macon	Mercer University	Spright Dowell
Macon	Wesleyan College	Dice R. Anderson
Milledgeville	Georgia State College for Women	Guy H. Wells
Mount Berry	Berry College	Martha Berry
Oglethorpe University	Oglethorpe University	Thornwell Jacobs
Rome	Shorter College	Paul M. Cousins
Valdosta	Georgia State Woman's College	Frank R. Reade
Idaho		
Albion	Albion State Normal School	R. H. Snyder
Caldwell	The College of Idaho	Raymond H. Leach
Lewiston	Lewiston State Normal School	J. E. Turner
Moscow	University of Idaho	Harrison C. Dale
Nampa	Northwest Nazarene College	Russell V. DeLong
Wesleyan	Gooding College	W. F. Shaw
Illinois		
Alton	Shurtleff College	P. L. Thompson
Aurora	Aurora College	Theodore Pierson Stephens
Bloomington	Illinois Wesleyan University	Wylie G. Brooks
Bourbonnais	St. Viator College	E. V. Cardinal
Carbondale	Southern Illinois State Normal University	Roscoe Pulliam
Carthage	Carthage College	Rudolph G. Schulz, Jr.
Charleston	Eastern Illinois State Teachers College	Robert G. Buzzard
Chicago	Armour Institute of Technology	Henry T. Heald, Acting
Chicago	Central Y. M. C. A. College	Edward J. Sparling
Chicago	Chicago College of Osteopathy	R. N. MacBain, Dean
Chicago	Chicago Normal College	Verne O. Graham
Chicago	De Paul University	Michael J. O'Connell
Chicago	George Williams College	Harold C. Coffman
Chicago	Lewis Institute	D. C. Jackson, Jr.
Chicago	Loyola University	Samuel K. Wilson
Chicago	Mundelein College	Sister M. Consuela
Chicago	Pestalozzi Froebel Teachers College	Herman H. Hegner
Chicago	St. Xavier College for Women	Sister Mary Genevieve
Chicago	The Chicago Theological Seminary	Albert W. Palmer
Chicago	The University of Chicago	Robert M. Hutchins
Decatur	James Millikin University	John C. Hessler
De Kalb	Northern Illinois State Teachers College	Karl L. Adams
Elsah	The Principia	Frederic E. Morgan
Elmhurst	Elmhurst College	Timothy Lehmann
Eureka	Eureka College	Raymond F. McLain
Evanston	National College of Education	Edna Dean Baker
Evanston	Northwestern University	Walter Dill Scott
Galesburg	Knox College	Carter Davidson
Greenville	Greenville College	H. J. Long
Jacksonville	Illinois College	Harris Gary Hudson
Jacksonville	MacMurray College	C. P. McClelland
Joliet	College of St. Francis	Mother M. Thomasine
Lake Forest	Lake Forest College	H. McComb Moore
Lebanon	McKendree College	C. R. Yost
Lisle	St. Procopius College	Procopius Neuzil
Macomb	Western Illinois State Teachers College	W. P. Morgan
Monmouth	Monmouth College	James H. Grier
Mundelein	St. Mary of the Lake Seminary	Reynold Hillenbrand
Naperville	North Central College	Edward E. Rall
Normal	Illinois State Normal University	R. W. Fairchild
Peoria	Bradley Polytechnic Institute	F. R. Hamilton
Peru	St. Bede College	Justus Wirth
River Forest	Rosary College	Sister Mary Evelyn
Rockford	Rockford College	Mary A. Cheek
Rock Island	Augustana College and Theological Seminary	Conrad Bergendoff
Urbana-Champaign	University of Illinois	A. C. Willard
Wheaton	Wheaton College	J. O. Buswell, Jr.
Indiana		
Bloomington	Indiana University	Herman B. Wells, Acting
Crawfordsville	Wabash College	Louis B. Hopkins
Danville	Central Normal College	Carl H. Griffey
Evansville	Evansville College	F. Marion Smith
Franklin	Franklin College	Wm. Gear Spencer
Goshen	Goshen College	Sanford C. Yoder
Greencastle	DePauw University	Clyde E. Wildman
Hanover	Hanover College	A. G. Parker, Jr.
Huntington	Huntington College	Harold C. Mason
Indianapolis	Butler University	James W. Putnam
Indianapolis	Indiana Central College	I. J. Good
Indianapolis	Indianapolis College of Pharmacy	F. E. Bibbins
Indianapolis	Normal College of the American Gymnastic Union	Carl B. Sputh
Lafayette	Purdue University	Edward C. Elliott
Marion	Marion College	Wm. F. McConn
Muncie	Ball State Teachers College	L. A. Pittenger
N. Manchester	Manchester College	Otho Winger
Notre Dame	St. Mary's College	Sister M. Madeleva
Notre Dame	University of Notre Dame	John F. O'Hara
Oakland City	Oakland City College	W. P. Dearing
Richmond	Earlham College	William C. Dennis
St. Mary-of-the-Woods	St. Mary-of-the-Woods College	Mother Mary Raphael
Terre Haute	Indiana State Teachers College	Ralph N. Tirey
Terre Haute	Rose Polytechnic Institute	Donald B. Prentice
Upland	Taylor University	Robert Lee Stuart
Valparaiso	Valparaiso University	O. C. Kreinheder
Iowa		
Ames	Iowa State College of Agriculture and Mechanic Arts	Charles E. Friley
Cedar Falls	Iowa State Teachers College	O. R. Latham
Cedar Rapids	Coe College	Harry M. Gage
Davenport	St. Ambrose College	Martin Cone
Decorah	Luther College	O. J. H. Preus
Des Moines	Des Moines College of Pharmacy	F. W. Fitch
Des Moines	Des Moines Still College of Osteopathy	A. B. Becker
Des Moines	Drake University	D. W. Morehouse
Dubuque	Clarke College	Sister Mary Antonia
Dubuque	Columbia College	Thomas Conry
Dubuque	University of Dubuque	Dale D. Welch
Fairfield	Parsons College	Clarence W. Greene
Fayette	Upper Iowa University	W. C. Mongold, Acting
Grinnell	Grinnell College	John S. Nollen

City	Institution	President
Indianola	Simpson College	Earl E. Harper
Iowa City	State University of Iowa	Eugene A. Gilmore
Le Mars	Western Union College	D. O. Kime
Mount Pleasant	Iowa Wesleyan College	Harry D. Henry
Mount Vernon	Cornell College	H. J. Burgstahler
Oskaloosa	William Penn College	Henry Edwin McGrew
Pella	Central College	Irwin J. Lubbers
Sioux City	Morningside College	Earl A. Roadman
Sioux City	Trinity College	John A. Elbert
Storm Lake	Buena Vista College	Henry Olson
University Park	John Fletcher College	Charles W. Butler
Waverley	Wartburg College	E. J. Braulick

Kansas

Atchison	Mt. St. Scholastica College	Mother Lucy Dooley
Atchison	St. Benedict's College	Martin Veth
Baldwin	Baker University	Nelson P. Horn
Bethel College	Bethel College	Ed. G. Kaufman
Emporia	College of Emporia	John Bailey Kelly
Emporia	Kansas State Teachers College	Thomas W. Butcher
Hays	Fort Hays Kansas State College	C. E. Rarick
Lawrence	University of Kansas	E. H. Lindley
Leavenworth	St. Mary College	Arthur M. Murphy
Lindsborg	Bethany College	Ernst F. Pihlblad
McPherson	McPherson College	V. F. Schwalm
Manhattan	Kansas State College of Agriculture and Applied Science	Francis D. Farrell
Ottawa	Ottawa University	Andrew B. Martin
Pittsburg	Kansas State Teachers College	W. A. Brandenburg
St. Marys	St. Mary's College	M. Germing
Salina	Kansas Wesleyan University	J. R. McFadden, Acting
Salina	Marymount College	Mother Rose Waller
Sterling	Sterling College	H. A. Kelsey
Topeka	Washburn College	Philip C. King
Wichita	Friends University	David M. Edwards
Wichita	Municipal University of Wichita	William M. Jardine
Winfield	Southwestern College	Frank E. Mossman

Kentucky

Barbourville	Union College	John Owen Gross
Berea	Berea College	Wm. J. Hutchins
Bowling Green	Western Teachers College	Paul L. Garrett
Covington	Villa Madonna College	M. Leick
Danville	Centre College of Kentucky	James H. Hewlett, Acting
Frankfort	Kentucky State Industrial College	R. B. Atwood
Georgetown	Georgetown College	Henry Noble Sherwood
Lexington	Transylvania College	Arthur Braden
Lexington	University of Kentucky	Frank L. McVey
Louisville	Louisville College of Pharmacy	A. P. Markendorf
Louisville	Louisville Municipal College for Negroes, University of Louisville	Raymond A. Kent
Louisville	Nazareth College	Sister Mary Anastasia Coady
Louisville	Southern Baptist Theological Seminary	John R. Sampey
Louisville	University of Louisville	Raymond A. Kent
Morehead	Morehead State Teachers College	H. A. Babb
Murray	Murray State Teachers College	James H. Richmond
Richmond	Eastern Kentucky State Teachers College	H. L. Donovan
Wilmore	Asbury College	Z. T. Johnson, Exec. V. Pres.
Winchester	Kentucky Wesleyan College	Paul Shell Powell

Louisiana

Baton Rouge	Louisiana State University and Agricultural & Mechanical College	James M. Smith
Lafayette	Southwestern Louisiana Institute	Luther E. Frazer
Natchitoches	Louisiana State Normal College	A. A. Fredericks
New Orleans	Dillard University	William S. Nelson
New Orleans	Loyola University	Harold A. Gaudin
New Orleans	Newcomb College	Pierce Butler, Dean
New Orleans	St. Mary's Dominican College	Mother Mary Catherine
New Orleans	Tulane University of Louisiana	Rufus C. Harris
New Orleans	Ursuline College	Mother Mary B. Bonhomme
New Orleans	Xavier University	Mother M. Agatha
Pineville	Louisiana College	Claybrook Cottingham
Ruston	Louisiana Polytechnic Institute	E. S. Richardson
Scotlandville	Southern University	Felton Clark
Shreveport	Centenary College	Pierce Cline

Maine

Brunswick	Bowdoin College	Kenneth C. M. Sills
Castine	Eastern State Normal School	William D. Hall
Farmington	State Teachers College	Wilbert G. Mallett
Fort Kent	Madawaska Training School	Richard F. Crocker*
Gorham	State Normal School	Walter E. Russell
Lewiston	Bates College	Clifton D. Gray
Machias	Washington State Normal School	Philip H. Kimball*
Orono	University of Maine	Arthur A. Hauck
Presque Isle	Aroostook State Normal School	San L. Merriman
Waterville	Colby College	Franklin W. Johnson

Maryland

Annapolis	St. John's College	Stringfellow Barr
Annapolis	United States Naval Academy	David F. Sellers, Supt.
Baltimore	College of Notre Dame of Maryland	Sister M. Frances
Baltimore	Goucher College	David A. Robertson
Baltimore	Johns Hopkins University	Isaiah Bowman
Baltimore	Loyola College	J. A. Canning
Baltimore	Morgan College	D. O. W. Holmes
Baltimore	St. Mary's Seminary & University	John F. Fenlon
Bowie	Maryland Normal School	L. S. James
Chestertown	Washington College	Gilbert W. Mead
College Park	University of Maryland	H. C. Byrd
Emmitsburg	Mount St. Mary's College	John L. Sheridan
Emmitsburg	St. Joseph's College	Sister Paula
Frederick	Hood College	Henry I. Stahr
Frostburg	State Teachers College	John L. Dunkle*
Lutherville	Maryland College for Women	Frederick E. Metzger
New Windsor	Blue Ridge College	W. S. Y. Critchley
Salisbury	State Teachers College	J. D. Blackwell
Towson	State Teachers College	Lida Lee Tall
Westminster	Western Maryland College	F. G. Holloway

Massachusetts

Amherst	Amherst College	Stanley King
Amherst	Massachusetts State College	Hugh P. Baker
Boston	Boston University	Daniel L. Marsh
Boston	Massachusetts College of Pharmacy	H. C. Newton, Dean
Boston	Northeastern University	Frank P. Speare
Boston	Simmons College	Bancroft Beatley
Boston	Teachers College of the City of Boston	Wm. H. J. Kennedy
Bridgewater	State Teachers College	John J. Kelly
Cambridge	Harvard University	James B. Conant
Cambridge	Massachusetts Institute of Technology	Karl T. Compton
Cambridge	Radcliffe College	Ada L. Comstock
Chestnut Hill	Boston College	Wm. J. McGarry
Fitchburg	State Teachers College	Charles M. Herlihy
Framingham	State Teachers College	M. F. O'Connor
Hyannis	State Teachers College	Herbert H. Howes
Lowell	Lowell Textile Institute	Charles H. Eames
Lowell	State Teachers College	James Dugan
Medford	Tufts College	George S. Miller, Acting
Newton Center	Andover Newton Theological School	Everett C. Herrick
North Adams	State Teachers College	Grover C. Bowman
Northampton	Smith College	William A. Neilson
Norton	Wheaton College	John Edgar Park
Salem	State Teachers College	Edward A. Sullivan
South Hadley	Mount Holyoke College	Roswell G. Ham
South Lancaster	Atlantic Union College	G. Eric Jones
Springfield	American International College	C. S. McGown
Springfield	Springfield College	Ernest M. Best
Waltham	Middlesex University	C. Ruggles Smith
Wellesley	Wellesley College	Mildred H. McAfee
Westfield	State Teachers College	Edw. J. Scanlon
Weston	Regis College	Sister Genevieve Marie
Williamstown	Williams College	J. P. Baxter, 3rd
Worcester	Clark University	Wallace W. Atwood
Worcester	College of the Holy Cross	Francis J. Dolan
Worcester	State Teachers College	Wm. B. Aspinwall
Worcester	Worcester Polytechnic Institute	Ralph Earle

Michigan

Adrian	Adrian College	Harlan L. Feeman
Adrian	St. Joseph College	Mother M. Gerald
Albion	Albion College	John L. Seaton
Alma	Alma College	Harry M. Crooks
Ann Arbor	University of Michigan	Alex. G. Ruthven
Battle Creek	Battle Creek College	Emil Leffler
Berrien Springs	Emmanuel Missionary College	H. J. Klooster
Big Rapids	Ferris Institute	M. S. Ward

City	Institution	President
Detroit	Detroit College of Law	Wm. Krichbaum, Dean
Detroit	Detroit Institute of Technology	Paul Hickey
Detroit	Marygrove College	Sister M. Honora
Detroit	Sacred Heart Seminary	Daniel J. Ryan
Detroit	University of Detroit	A. H. Poetker
Detroit	Wayne University	Charles L. Spain, Exec. V. Pres.
East Lansing	Michigan State College of Agriculture and Applied Science	Robert S. Shaw
Grand Rapids	Calvin College	Ralph Stob
Hillsdale	Hillsdale College	Willfred Mauck
Holland	Hope College	Wynand Wichers
Houghton	Michigan College of Mining and Technology	Grover C. Dillman
Kalamazoo	Kalamazoo College	Stewart Grant Cole
Kalamazoo	Western State Teachers College	Paul V. Sangren
Marquette	Northern State Teachers College	Webster H. Pearce
Mt. Pleasant	Central State Teachers College	E. C. Warriner
Nazareth	Nazareth College	Sister M. Celestine
Olivet	Olivet College	Joseph Brewer
Ypsilanti	Michigan State Normal College	J. M. Munson

Minnesota

Bemidji	State Teachers College	C. R. Sattgast
Collegeville	St. John's University	Alcuin Deutsch
Duluth	State Teachers College	Herbert Sorenson
Mankato	State Teachers College	Frank D. McElroy
Minneapolis	Augsburg Seminary and College	H. N. Hendrickson, Acting
Minneapolis	University of Minnesota	Lotus D. Coffman
Moorhead	Concordia College	J. N. Brown
Moorhead	Moorhead State Teachers College	R. B. MacLean
New Ulm	Dr. Martin Luther College	Carl L. Schweppe
Northfield	Carleton College	Donald J. Cowling
Northfield	St. Olaf College	L. W. Boe
St. Cloud	State Teachers College	George A. Selke
St. Joseph	College of St. Benedict	Sister Rosamond
St. Paul	Bethel Institute	G. A. Hagstrom
St. Paul	College of St. Catherine	Sister Eucharista
St. Paul	College of St. Thomas	James H. Moynihan
St. Paul	Hamline University	Charles N. Pace
St. Paul	Macalester College	John C. Acheson
St. Peter	Gustavus Adolphus College	O. J. Johnson
Winona	College of St. Teresa	Sister Mary A. Molloy
Winona	St. Mary's College	Brother Leopold
Winona	Winona State Teachers College	Guy E. Maxwell

Mississippi

Alcorn	Agricultural & Mechanical College	Wm. H. Bell
Blue Mountain	Blue Mountain College	Lawrence T. Lowrey
Cleveland	Delta State Teachers College	W. M. Kethley
Clinton	Mississippi College	D. M. Nelson
Columbus	Mississippi State College for Women	B. L. Parkinson
Hattiesburg	Mississippi Woman's College	W. E. Holcomb
Hattiesburg	State Teachers College	J. B. George
Holly Springs	Rust College	L. M. McCoy
Jackson	Belhaven College	G. T. Gillespie
Jackson	Jackson College	B. Baldwin Dansby
Jackson	Millsaps College	D. M. Key
State College	Mississippi State College	G. D. Humphrey
Tougaloo	Tougaloo College	Judson L. Cross
University	University of Mississippi	A. B. Butts, Chancellor

Missouri

Canton	Culver Stockton College	W. H. McDonald
Cape Girardeau	Southeast Missouri State Teachers College	Walter W. Parker
Columbia	University of Missouri	F. A. Middlebush
Fayette	Central College	Robert H. Ruff
Fulton	Westminster College	F. L. McCluer
Jefferson City	Lincoln University	Wm. B. Jason, Acting
Kansas City	Kansas City College of Osteopathy & Surgery	Geo. J. Conley
Kansas City	Kansas City-Western Dental College	R. J. Rinehart, Dean
Kansas City	Rockhurst College	Daniel H. Conway
Kansas City	Kansas City Teachers College	J. C. Bond
Kirksville	Kirksville College of Osteopathy & Surgery	Geo. M. Laughlin
Kirksville	State Teachers College	Walter H. Ryle
Liberty	William Jewell College	John F. Herget
Marshall	Missouri Valley College	George H. Mack
Maryville	Northwest Missouri State Teachers College	Uel W. Lamkin
Parkville	Park College	Wm. Lindsay Young
St. Charles	Lindenwood College	John L. Roemer
St. Louis	Concordia Theological Seminary	L. Fuerbringer
St. Louis	Harris Teachers College	C. G. Vannest
St. Louis	Maryville College	Mother M. O. Mouton
St. Louis	St. Louis University	H. B. Crimmins
St. Louis	Stowe Teachers College	Ruth Harris, Chmn.
St. Louis	Washington University	George R. Throop, Chancellor
Springfield	Drury College	T. W. Nadal
Springfield	Southwest Missouri State Teachers College	Roy Ellis
Tarkio	Tarkio College	M. E. Collins
Warrensburg	Central Missouri State Teachers College	G. W. Diemer
Webster Groves	Webster College	George F. Donovan

Montana

Billings	Eastern Montana State Normal School	L. B. McMullen
Billings	Intermountain Union College	C. L. Clifford, Acting
Bozeman	Montana State College	A. L. Strand
Butte	Montana School of Mines	Francis A. Thomson
Dillon	Montana State Normal College	Sheldon E. Davis
Helena	Carroll College	Emmet Riley
Missoula	Montana State University	George F. Simmons
Polytechnic	Billings Polytechnic Institute	Ernest T. Eaton

Nebraska

Blair	Dana College	C. X. Hansen, Acting
Central City	Nebraska Central College	O. W. Carrell
Chadron	Nebraska State Teachers College	Robert I. Elliott
Crete	Doane College	Bryan S. Stoffer
Fremont	Midland College	H. F. Martin
Hastings	Hastings College	J. W. Creighton
Kearney	State Teachers College	Herbert L. Cushing
Lincoln	Nebraska Wesleyan University	
Lincoln	Union College	M. L. Andreasen
Lincoln	University of Nebraska	E. A. Burnett, Chancellor
Omaha	Creighton University	Joseph P. Zuercher
Omaha	University of Omaha	Rowland Haynes
Peru	Peru State Teachers College	W. R. Pate
Seward	Concordia Teachers College	C. F. Brommer
Wayne	State Teachers College	J. T. Anderson
York	York College	J. R. Overmiller

Nevada

Reno	University of Nevada	Walter E. Clark

New Hampshire

Durham	University of New Hampshire	Fred Engelhardt
Hanover	Dartmouth College	Ernest M. Hopkins
Keene	Keene Normal School	Wallace E. Mason
Manchester	St. Anselm's College	Bertrand C. Dolan
Plymouth	Plymouth Normal School	Ernest L. Silver

New Jersey

Convent Station	College of St. Elizabeth	Sister Marie Jose Byrne, Dean
East Orange	Panzer College of Physical Education and Hygiene	Margaret C. Brown
East Orange	Upsala College	Frans Ericsson, Acting
Glassboro	New Jersey State Teachers College	Edgar F. Bunce
Hoboken	Stevens Institute of Technology	Harvey N. Davis
Jersey City	St. Peter's College	Denis J. Comey
Jersey City	New Jersey State Teachers College	Roy L. Shaffer
Lakewood	Georgian Court College	Mother Mary John, Dean
Madison	Drew University	Arlo Ayres Brown
Montclair	New Jersey State Teachers College	Harry A. Sprague
Newark	Newark College of Engineering	Allan R. Cullimore
Newark	New Jersey State Teachers College	M. Ernest Townsend
Newark	University of Newark	Frank Kingdon
New Brunswick	New Jersey College for Women	Margaret T. Corwin, Dean
New Brunswick	Rutgers University	Robert C. Clothier
Paterson	New Jersey State Teachers College	C. S. Wightman
Princeton	Princeton Theological Seminary	John A. Mackay
Princeton	Princeton University	Harold W. Dodds
Princeton	St. Joseph's College	Anthony Kieffer
South Orange	Seton Hall College	James Kelley
Trenton	State Teachers College	Roscoe L. West

City	Institution	President
New Mexico		
Albuquerque	University of New Mexico	J. F. Zimmerman
El Rito	Spanish-American Normal School	Joseph B. Grant
Las Vegas	New Mexico Normal University	H. C. Gossard
Silver City	New Mexico State Teachers College	H. W. James
Socorro	New Mexico School of Mines	E. H. Wells
State College	New Mexico State College	Ray Fife
New York		
Albany	College of St. Rose	Edmund F. Gibbons
Albany	State College for Teachers	A. R. Brubacher
Alfred	Alfred University	J. Nelson Norwood
Annandale-on-Hudson	Bard College, Columbia University	Harold Mestre, Acting Dean
Auburn	Auburn Theological Seminary	Paul Silas Heath
Aurora	Wells College	William E. Weld
Brockport	State Normal School	E. C. Hartwell
Bronxville	Sarah Lawrence College	Constance Warren
Brooklyn	Brooklyn College	William A. Boylan
Brooklyn	Long Island University	Tristram W. Metcalfe, Dean
Brooklyn	Polytechnic Institute of Brooklyn	Harry S. Rogers
Brooklyn	Saint Francis College	Brother Columba
Brooklyn	St. John's University	Edward J. Walsh
Buffalo	Canisius College	James P. Sweeney
Buffalo	D'Youville College	Sister Grace of the Sacred Heart
Buffalo	State Teachers College	Harry W. Rockwell
Buffalo	University of Buffalo	Samuel Paul Capen, Chancellor
Canton	St. Lawrence University	Laurens H. Seelye
Clinton	Hamilton College	Frederick C. Ferry
Cortland	Cortland Normal School	H. DeW. DeGroat*
Elmira	Elmira College	W. S. A. Pott
Fredonia	State Normal School	L. R. Gregory*
Garden City	Adelphi College	Paul Dawson Eddy
Geneseo	State Normal School	James B. Welles
Geneva	Hobart College	William A. Eddy
Hamilton	Colgate University	George B. Cutten
Houghton	Houghton College	Stephen W. Paine
Ithaca	Cornell University	Edmund Ezra Day
Ithaca	Ithaca College	Leonard Bliss Job
Keuka Park	Keuka College	J. Hillis Miller
New Paltz	State Normal School	L. H. van den Berg
New Rochelle	College of New Rochelle	
New York	Barnard College	Virginia C. Gildersleeve, Dean
New York	Biblical Seminary in New York	Wilbert W. White
New York	College of the City of New York	F. B. Robinson
New York	College of Mount St. Vincent	Sister Catharine Marie, Dean
New York	Manhattanville College of The Sacred Heart	Mother Grace C. Dammann
New York	Columbia University	Nicholas M. Butler
New York	Cooper Union	Gano Dunn
New York	Fordham University	Robert I. Gannon
New York	General Theological Seminary	H. Fosbroke, Dean
New York	Hunter College of the City of N.Y.	Eugene A. Colligan
New York	Jewish Theological Seminary of America	Cyrus Adler
New York	Manhattan College	Brother Patrick
New York	New York Medical College	Claude A. Burrett, Dean
New York	New York University	Harry W. Chase, Chancellor
New York	Savage School for Physical Education	Ella W. Savage
New York	Teachers College, Columbia University	Wm. F. Russell, Dean
New York	Union Theological Seminary	Henry S. Coffin
New York	Yeshiva College	Bernard Revel
Niagara Falls	Niagara University	Joseph M. Noonan
Oneonta	Hartwick College	Chas. W. Leitzell
Oneonta	State Normal School	Chas. W. Hunt*
Oswego	State Normal School	Ralph W. Swetman*
Plattsburgh	Plattsburgh State Normal School	Charles C. Ward
Potsdam	Clarkson College of Technology	James Shelby Thomas
Potsdam	State Normal School	R. T. Congdon*
Poughkeepsie	Vassar College	H. N. MacCracken
Rochester	Nazareth College of Rochester	Sister M. Sylvester
Rochester	The Colgate-Rochester Divinity School	Albert W. Beaven
Rochester	University of Rochester	Alan Valentine
St. Bonaventure	St. Bonaventure College	Thomas Plassmann
Saratoga Springs	Skidmore College	Henry T. Moore
Schenectady	Union College	Dixon Ryan Fox
Staten Island	Wagner Memorial Lutheran College	Clarence C. Stoughton
Syracuse	New York State College of Forestry	Samuel N. Spring, Dean
Syracuse	Syracuse City Normal School	Wm. W. Wright*
Syracuse	Syracuse University	W. P. Graham
Tarrytown	Marymount College	Mother M. Gerard
Troy	Rensselaer Polytechnic Institute	Wm. O. Hotchkiss
Troy	Russell Sage College	J. L. Meader
West Point	United States Military Academy	J. L. Benedict
White Plains	Good Counsel College	Mother M. Aloysia
North Carolina		
Asheville	Asheville Normal & Teachers College	
Boone	Appalachian State Teachers College	B. B. Dougherty
Chapel Hill	University of North Carolina	Frank P. Graham
Charlotte	Johnson C. Smith University	H. L. McCrorey
Charlotte	Queens-Chicora College	W. H. Frazer
Cullowhee	Western Carolina Teachers College	H. T. Hunter
Davidson	Davidson College	Walter L. Lingle
Durham	Duke University	Wm. Preston Few
Durham	North Carolina College for Negroes	James E. Shepard
Elizabeth City	State Normal School	J. H. Bias
Elon College	Elon College	Leon E. Smith
Fayetteville	State Normal School	J. W. Seabrook
Greensboro	Agricultural & Technical College	F. D. Bluford
Greensboro	Bennett College	David D. Jones
Greensboro	Greensboro College	Luther L. Gobbel
Greensboro	Woman's College of the University of North Carolina	W. C. Jackson, Dean
Greenville	East Carolina Teachers College	Leon R. Meadows
Guilford College	Guilford College	Clyde A. Milner
Hickory	Lenoir Rhyne College	P. E. Monroe
High Point	High Point College	G. I. Humphreys
Raleigh	Meredith College	Charles E. Brewer
Raleigh	North Carolina State College of Agriculture & Engineering, University of North Carolina	John W. Harrelson, Dean
Raleigh	St. Augustine's College	Edgar H. Goold
Raleigh	Shaw University	Robert P. Daniel
Red Springs	Flora MacDonald College	Henry C. Bedinger
Salisbury	Catawba College	Howard R. Omwake
Salisbury	Livingstone College	W. J. Trent
Wake Forest	Wake Forest College	Thurman D. Kitchin
Wilson	Atlantic Christian College	H. S. Hilley
Winston-Salem	Salem College	H. E. Rondthaler
Winston-Salem	Winston-Salem Teachers College	F. L. Atkins
North Dakota		
Dickinson	State Teachers College	H. O. Pippin
Ellendale	State Normal & Industrial School	J. C. McMillan
Fargo	North Dakota Agricultural College	John C. West, Acting
Grand Forks	University of North Dakota	John C. West
Grand Forks	Wesley College	Charles L. Wallace
Jamestown	Jamestown College	B. H. Kroeze
Mayville	State Teachers College	Carl C. Swain
Minot	State Teachers College	G. A. McFarland
Valley City	State Teachers College	James E. Cox
Ohio		
Ada	Ohio Northern University	Robert Williams
Akron	University of Akron	H. E. Simmons
Alliance	Mount Union College	Wm. H. McMaster
Ashland	Ashland College	Charles L. Anspach
Athens	Ohio University	Herman G. James
Berea	Baldwin-Wallace College	Louis Clinton Wright
Bluffton	Bluffton College	A. S. Rosenberger
Bowling Green	Bowling Green State University	R. E. Offenhauer
Cedarville	Cedarville College	W. R. McChesney
Cincinnati	Teachers College, Athenaeum of Ohio	Carl J. Ryan, Dean
Cincinnati	University of Cincinnati	Raymond Walters
Cincinnati	Xavier University	Dennis F. Burns
Cleveland	John Carroll University	B. J. Rodman
Cleveland	Case School of Applied Science	Wm. E. Wickenden
Cleveland	Fenn College	C. V. Thomas
Cleveland	Ursuline College	Mother M. Veronica Nash
Cleveland	Western Reserve University	W. G. Leutner
Columbus	Capital University	Otto Mees
Columbus	Ohio State University	G. W. Rightmire
Columbus	St. Mary of the Springs College	Sister M. Aloyse
Dayton	University of Dayton	Walter C. Tredtin
Defiance	Defiance College	John W. Claxton

City	Institution	President
Delaware	Ohio Wesleyan University	Edmund D. Soper
Findlay	Findlay College	H. R. Dunathan
Gambier	Kenyon College	Gordon K. Chalmers
Granville	Denison University	A. A. Shaw
Hiram	Hiram College	Kenneth I. Brown
Kent	Kent State University	J. O. Engleman
Marietta	Marietta College	Harry K. Eversull
Mount St. Joseph	College of Mount St. Joseph	Mother Mary Regina
New Concord	Muskingum College	R. N. Montgomery
Oberlin	Oberlin College	Ernest H. Wilkins
Oxford	Miami University	A. H. Upham
Oxford	Western College	Ralph K. Hickok
Painesville	Lake Erie College	Vivian B. Small
South Euclid	Notre Dame College	Mother Mary Evarista
Springfield	Wittenberg College	Rees Edgar Tulloss
Tiffin	Heidelberg College	Clarence E. Josephson
Toledo	Mary Manse College	Sister Mary Aquinas, Dean
Toledo	De Sales College	F. J. Macelwane
Toledo	University of the City of Toledo	Philip Curtis Nash
Westerville	Otterbein College	W. G. Clippinger
Wilberforce	Wilberforce University	D. O. Walker
Wilmington	Wilmington College	Walter L. Collins
Wooster	The College of Wooster	Charles F. Wishart
Yellow Springs	Antioch College	A. D. Henderson
Youngstown	Youngstown College	Howard W. Jones

Oklahoma

Ada	East Central State Teachers College	A. Linscheid
Alva	Northwestern Teachers College	Ernest E. Brown
Bethany	Bethany-Peniel College	A. K. Bracken
Chickasha	Oklahoma College for Women	M. A. Nash
Durant	Southeastern State Teachers College	H. Vance Posey
Edmond	Central State Teachers College	John O. Moseley
Enid	Phillips University	I. N. McCash
Goodwell	Panhandle Agricultural & Mechanical College	Edward L. Morrison
Guthrie	Catholic College of Oklahoma for Women	Mother Mary Agnes Arvin
Langston	Colored Agricultural & Normal University	J. W. Sanford
Norman	University of Oklahoma	Wm. B. Bizzell
Oklahoma City	Oklahoma City University	A. G. Williamson
Shawnee	Oklahoma Baptist University	John W. Raley
Stillwater	Oklahoma Agricultural & Mechanical College	Henry G. Bennett
Tahlequah	Northeastern State Teachers College	John Vaughan
Tulsa	University of Tulsa	C. I. Pontius
Weatherford	Southwestern State Teachers College	W. W. Isle

Oregon

Albany	Albany College	Thomas W. Bibb
Ashland	Southern Oregon State Normal School	Walter Redford
Corvallis	Oregon State College	George W. Peavy
Eugene	University of Oregon	Clarence V. Boyer
Forest Grove	Pacific University	John F. Dobbs
La Grande	Eastern Oregon Normal School	C. A. Howard
McMinnville	Linfield College	Elam J. Anderson
Monmouth	Oregon Normal School	J. A. Churchill
Newberg	Pacific College	Levi T. Pennington
Oswego	Marylhurst College	Sister M. Elizabeth Clare
Portland	North Pacific College	Herbert C. Miller
Portland	Reed College	Dexter M. Keezer
Portland	University of Portland	Michael J. Early
Salem	Willamette University	Bruce R. Baxter

Pennsylvania

Allentown	Cedar Crest College	Wm. F. Curtis
Allentown	Muhlenberg College	Levering Tyson
Annville	Lebanon Valley College	Clyde A. Lynch
Beaver Falls	Geneva College	M. M. Pearce
Bethlehem	Lehigh University	Clement C. Williams
Bethlehem	Moravian College and Theological Seminary	Wm. N. Schwarze
Bethlehem	Moravian College for Women	Edwin J. Heath
Bloomsburg	State Teachers College	Francis B. Haas
Bryn Athyn	Academy of the New Church	George de Charms
Bryn Mawr	Bryn Mawr College	Marion E. Park
California	California State Teachers College	Robert M. Steele
Carlisle	Dickinson College	Fred P. Corson
Chambersburg	Wilson College	Paul S. Havens
Chester	Crozier Theological Seminary	James H. Franklin
Chester	Pennsylvania Military College	Frank K. Hyatt
Chestnut Hill	Mount St. Joseph College	Mother Mary James
Cheyney	State Teachers College	L. P. Hill
Clarion	State Teachers College	Paul G. Chandler
Collegeville	Ursinus College	N. E. McClure
Dallas	College Misericordia	Sister M. Loretta
Easton	Lafayette College	Wm. Mather Lewis
East Stroudsburg	State Teachers College	T. T. Allen
Edinboro	State Teachers College	Carmon A. Ross
Elizabethtown	Elizabethtown College	Ralph W. Schlosser
Erie	Mercyhurst College	Sister M. Xavier O'Neil
Erie	Villa Maria College	Joseph J. Wehrle
Gettysburg	Gettysburg College	H. W. A. Hanson
Greensburg	Seton Hill College	J. A. W. Reeves
Greenville	Thiel College	Earl S. Rudisill
Grove City	Grove City College	Weir C. Ketler
Haverford	Haverford College	W. W. Comfort
Huntingdon	Juniata College	Charles C. Ellis
Immaculata	Immaculata College	Francis J. Furey
Indiana	Indiana State Teachers College	Samuel Fausold
Jenkintown	Beaver College	W. B. Greenway
Kutztown	State Teachers College	Quincy A. W. Rohrbach
Lancaster	Franklin & Marshall College	John A. Schaeffer
Latrobe	St. Vincent College	Alfred Koch
Lewisburg	Bucknell University	Arnaud C. Marts
Lincoln Univ.	Lincoln University	Walter L. Wright
Lock Haven	State Teachers College	John G. Flowers
Loretto	St. Francis College	Edw. P. M. Caraher
Mansfield	Mansfield State Teachers College	Joseph F. Noonan
Meadville	Allegheny College	Wm. P. Tolley
Millersville	State Teachers College	Landis Tanger
New Wilmington	Westminster College	Robert F. Galbreath
Philadelphia	Drexel Institute of Technology	Parke R. Kolbe
Philadelphia	Dropsie College	Cyrus Adler
Philadelphia	Hahnemann Medical College	Joseph S. Conwell
Philadelphia	Jefferson Medical College	Ross V. Patterson
Philadelphia	La Salle College	Brother E. Anselm
Philadelphia	Philadelphia College of Osteopathy	Edgar O. Holden
Philadelphia	Philadelphia College of Pharmacy & Science	Wilmer Krusen
Philadelphia	St. Joseph's College	Thomas J. Higgins
Philadelphia	Temple University	Charles E. Beury
Philadelphia	University of Pennsylvania	Thomas S. Gates
Philadelphia	Women's Medical College of Pennsylvania	Chevalier Jackson
Pittsburgh	Carnegie Institute of Technology	R. E. Doherty
Pittsburgh	Duquesne University	J. J. Callahan
Pittsburgh	Mount Mercy College	Mother M. Irenaeus
Pittsburgh	Pennsylvania College for Women	Herbert L. Spencer
Pittsburgh	University of Pittsburgh	John G. Bowman, Chancellor
Reading	Albright College	J. Warren Klein
Rosemont	Rosemont College	Mother Mary Ignatius
Scranton	Marywood College	Mother M. Josepha
Scranton	St. Thomas College	Brother D. Edward
Selinsgrove	Susquehanna University	G. Morris Smith
Shippensburg	State Teachers College	A. L. Rowland
Slippery Rock	State Teachers College	C. S. Miller
State College	Pennsylvania State College	Ralph D. Hetzel
Swarthmore	Swarthmore College	Frank Aydelotte
Villanova	Villanova College	E. V. Stanford
Washington	Washington & Jefferson College	Ralph Cooper Hutchison
Waynesburg	Waynesburg College	Paul R. Stewart
West Chester	State Teachers College	Charles S. Swope

Rhode Island

Kingston	Rhode Island State College	Raymond G. Bressler
Providence	Brown University	Henry M. Wriston
Providence	Providence College	John J. Dillon
Providence	Rhode Island College of Education	John L. Alger
Providence	Rhode Island College of Pharmacy	A. W. Claflin

South Carolina

Charleston	The Citadel—The Military College of South Carolina	Chas. P. Summerall
Charleston	College of Charleston	Harrison Randolph
Charleston	Medical College of the State of South Carolina	Robert Wilson
Clemson College	Clemson Agricultural College	Enoch W. Sikes
Clinton	Presbyterian College	William P. Jacobs
Columbia	Allen University	E. H. McGill
Columbia	Benedict College	J. J. Starks
Columbia	Columbia College	J. Caldwell Guilds
Columbia	University of South Carolina	J. R. McKissick

City	Institution	President
Due West	Erskine College	Robert C. Grier
Gaffney	Limestone College	R. C. Granberry
Greenville	Furman University	B. E. Geer
Greenville	Greenville Woman's College	B. E. Geer
Greenwood	Lander College	J. W. Speake
Hartsville	Coker College	C. Sylvester Green
Newberry	Newberry College	James C. Kinard
Orangeburg	Claflin College	J. B. Randolph
Orangeburg	State Agricultural and Mechanical College	M. F. Whittaker
Rock Hill	Winthrop College	Shelton Phelps
Spartanburg	Converse College	Edward M. Gwathmey
Spartanburg	Wofford College	Henry N. Snyder

South Dakota

Aberdeen	Northern State Teachers College	Carl G. Lawrence
Brookings	South Dakota State College of Agriculture & Mechanic Arts	C. W. Pugsley
Huron	Huron College	Frank L. Eversull
Madison	Eastern State Normal School	V. A. Lowry
Mitchell	Dakota Wesleyan University	Joseph H. Edge
Rapid City	State School of Mines	Joseph P. Connolly
Sioux Falls	Augustana College	Clemens M. Granskou
Sioux Falls	Sioux Falls College	Warren Palmer Behan
Spearfish	Spearfish Normal School	E. C. Woodburn
Springfield	Southern State Normal School	W. A. Thompson
Vermilion	University of South Dakota	I. D. Weeks
Yankton	Yankton College	G. W. Nash

Tennessee

Bristol	King College	Thomas P. Johnston
Chattanooga	University of Chattanooga	Alexander Guerry
Clarksville	Austin Peay Normal School	P. P. Claxton
Cookeville	Tennessee Polytechnic Institute	Q. M. Smith
Greenville	Tusculum College	C. A. Anderson
Harrogate	Lincoln Memorial University	S. W. McClelland
Jackson	Lambuth College	Richard E. Womack
Jackson	Lane College	J. F. Lane
Jackson	Union University	John J. Hurt
Jefferson City	Carson-Newman College	James T. Warren
Johnson City	State Teachers College	C. C. Sherrod
Knoxville	Knoxville College	S. M. Laing
Knoxville	The University of Tennessee	James D. Hoskins
Lebanon	Cumberland University	Ernest L. Stockton
Madison College	Nashville Agricultural Normal Institute	E. A. Sutherland
Maryville	Maryville College	Ralph Waldo Lloyd
McKenzie	Bethel College	L. L. Thomas
Memphis	Southwestern	Charles E. Diehl
Memphis	State Teachers College	J. W. Brister
Milligan College	Milligan College	H. J. Derthick
Murfreesboro	State Teachers College	P. A. Lyon
Murfreesboro	Tennessee College	E. L. Atwood
Nashville	Fisk University	Thomas E. Jones
Nashville	George Peabody College for Teachers	S. C. Garrison
Nashville	Scarritt College	Jesse Lee Cunninggim
Nashville	Tennessee Agricultural & Industrial State College	W. J. Hale
Nashville	Vanderbilt University	O. C. Carmichael
Sewanee	University of the South	Benj. F. Finney

Texas

Abilene	Abilene Christian College	James F. Cox
Abilene	Hardin-Simmons University	J. D. Sandefer
Abilene	McMurry College	T. W. Brabham
Alpine	Sul Ross State Teachers College	H. W. Morelock
Austin	Samuel Huston College	Stanley E. Grannum
Austin	St. Edward's University	P. J. Haggerty
Austin	Tillotson College	Mary E. Branch
Austin	The University of Texas	John Wm. Calhoun
Belton	Mary Hardin-Baylor College	Gordon G. Singleton
Brownwood	Daniel Baker College	Robert Guy Davis
Brownwood	Howard Payne College	Thomas H. Taylor
Canyon	West Texas State Teachers College	J. A. Hill
College Station	Agricultural & Mechanical College of Texas	T. O. Walton
Commerce	East Texas State Teachers College	Sam H. Whitley
Dallas	Southern Methodist University	Chas. C. Selecman
Denton	North Texas State Teachers College	W. J. McConnell
Denton	Texas State College for Women	Louis H. Hubbard
El Paso	Texas College of Mines and Metallurgy	D. M. Wiggins
Fort Worth	Texas Christian University	Edward McS. Waits
Fort Worth	Texas Wesleyan College	Law Sone
Georgetown	Southwestern University	J. W. Bergin
Houston	The Rice Institute	Edgar Odell Lovett
Huntsville	Sam Houston State Teachers College	C. N. Shaver
Kingsville	Texas College of Arts & Industries	J. O. Loftin
Lubbock	Texas Technological College	Bradford Knapp
Marshall	Bishop College	Joseph J. Rhoads
Marshall	Wiley College	M. W. Dogan
Nacogdoches	Stephen F. Austin State Teachers College	A. W. Birdwell
Prairie View	Prairie View State College	W. R. Banks*
San Antonio	Incarnate Word College	Sister M. Columkille
San Antonio	Our Lady of the Lake College	H. A. Constantineau
San Antonio	St. Mary's University of San Antonio	Alfred H. Rabe
San Marcos	Southwest Texas State Teachers College	C. E. Evans
Seguin	Guadalupe College	J. R. Lockett
Sherman	Austin College	Everett B. Tucker
Tyler	Texas College	D. R. Glass
Waco	Baylor University	Pat M. Neff
Waxahachie	Trinity University	F. L. Wear

Utah

Logan	Utah State Agricultural College	Elmer G. Peterson
Provo	Brigham Young University	Franklin S. Harris
Salt Lake City	College of St. Mary-of-the-Wasatch	Sister Mary Veronique
Salt Lake City	University of Utah	George Thomas

Vermont

Bennington	Bennington College	Robert D. Leigh
Burlington	Trinity College	Sister Mary Emmanuel
Burlington	University of Vermont	Guy W. Bailey
Castleton	State Normal School	Caroline S. Woodruff*
Johnson	State Normal School	Donald W. McClelland*
Middlebury	Middlebury College	Paul D. Moody
Northfield	Norwich University	Porter H. Adams
Winooski Park	St. Michael's College	L. E. Gosselin

Virginia

Alexandria	Protestant Episcopal Theological Seminary	W. E. Rollins
Ashland	Randolph-Macon College	Rob't E. Blackwell
Blacksburg	Virginia Polytechnic Institute	Julian A. Burruss
Bridgewater	Bridgewater College	Paul H. Bowman
Charlottesville	University of Virginia	John Lloyd Newcomb
Dayton	Shenandoah Conservatory of Music	Wade S. Miller
East Radford	State Teachers College	David W. Peters
Emory	Emory & Henry College	J. N. Hillman
Ettrick	Virginia State College for Negroes	John M. Gandy
Farmville	State Teachers College	J. L. Jarman
Fredericksburg	State Teachers College	Morgan L. Combs
Hampden-Sydney	Hampden-Sydney College	J. D. Eggleston
Hampton	Hampton Institute	Arthur Howe
Harrisonburg	State Teachers College	S. P. Duke
Hollins College	Hollins College	Bessie C. Randolph
Lawrenceville	St. Paul Normal School	J. A. Russell
Lexington	Virginia Military Institute	Chas. E. Kilbourne, Supt.
Lexington	Washington & Lee University	Francis P. Gaines
Lynchburg	Lynchburg College	R. B. Montgomery
Lynchburg	Randolph-Macon Woman's College	Theo. Henley Jack
Lynchburg	Virginia Theological Seminary and College	W. H. R. Powell
Richmond	Medical College of Virginia	William T. Sanger
Richmond	University of Richmond	F. W. Boatwright
Richmond	Virginia Union University	William J. Clark
Salem	Roanoke College	Chas. J. Smith
Staunton	Mary Baldwin College	L. Wilson Jarman
Sweet Briar	Sweet Briar College	Meta Glass
Williamsburg	College of William & Mary	John Stewart Bryan

Washington

Bellingham	Western Washington College of Education	C. H. Fisher
Cheney	Eastern Washington College of Education	R. T. Hargreaves
College Place	Walla Walla College	Wm. M. Landeen
Ellensburg	Central Washington College of Education	Rob't E. McConnell
Pullman	State College of Washington	Ernest O. Holland
Seattle	Seattle Pacific College	Charles H. Watson

City	Institution	President
Seattle	University of Washington	Lee Paul Sieg
Spokane	Gonzaga University	John Jos. Keep
Spokane	Whitworth College	Ward W. Sullivan
Tacoma	College of Puget Sound	Edward H. Todd
Walla Walla	Whitman College	Walter A. Bratton, Acting

West Virginia

Athens	Concord State Teachers College	J. Frank Marsh
Bethany	Bethany College	W. H. Cramblet
Bluefield	Bluefield State Teachers College	Henry Lake Dickason
Buckhannon	West Virginia Wesleyan College	Roy McCuskey
Charleston	Morris Harvey College	Leonard Riggleman
Elkins	Davis & Elkins College	Chas. E. Albert
Fairmont	Fairmont State Teachers College	Joseph Rosier
Glenville	Glenville State Teachers College	E. G. Rohrbough
Harpers Ferry	Storer College	H. T. McDonald
Huntington	Marshall College	James E. Allen
Institute	West Virginia State College	John W. Davis
Montgomery	New River State College	E. S. Maclin
Morgantown	West Virginia University	C. S. Boucher
Salem	Salem College	S. Orestes Bond
Shepherdstown	Shepherd State Teachers College	W. H. S. White
West Liberty	West Liberty State Teachers College	Paul N. Elbin

Wisconsin

Appleton	Lawrence College	Thomas N. Barrows
Ashland	Northland College	J. D. Brownell
Beloit	Beloit College	Irving Maurer
Eau Claire	State Teachers College	H. A. Schofield
La Crosse	State Teachers College	Geo. M. Snodgrass
Madison	University of Wisconsin	Clarence A. Dykstra
Menomonie	The Stout Institute	Burton E. Nelson
Milton	Milton College	Jay W. Crofoot
Milwaukee	Marquette University	Raphael C. McCarthy
Milwaukee	Milwaukee-Downer College	Lucia R. Briggs
Milwaukee	Mount Mary College	Edw. A. Fitzpatrick
Milwaukee	State Teachers College	Frank E. Baker
Nashotah	Nashotah House	E. J. Nutter
Oshkosh	State Teachers College	Forrest R. Polk
Platteville	State Teachers College	Asa M. Royce
Plymouth	Mission House College	Paul Grosshuesch
Ripon	Ripon College	Silas Evans
River Falls	State Teachers College	J. H. Ames
Stevens Point	Central State Teachers College	Frank S. Hyer
Superior	State Teachers College	Jim Dan Hill
Watertown	Northwestern College	Erwin E. Kowalke
Waukesha	Carroll College	Wm. A. Ganfield
West De Pere	St. Norbert College	B. H. Pennings
Whitewater	State Teachers College	C. M. Yoder

Wyoming

Laramie	University of Wyoming	Arthur G. Crane

Possessions

College, Alaska	University of Alaska	Charles E. Bunnell
Honolulu, Hawaii	University of Hawaii	David L. Crawford
Dumaguete, Philippine Islands	Silliman University	L. C. Winternheimer, Acting
Manila, Philippine Islands	De La Salle College	Brother Xavier
Manila, Philippine Islands	Mapua Institute of Technology	Tomas Mapua
Manila, Philippine Islands	Philippine Normal School	R. K. Gilmore, Supt.
Manila, Philippine Islands	University of the Philippines	Jorge Bocobo
Rio Piedras, Porto Rico	University of Puerto Rico	Juan B. Soto

Canada

Belleville, Ont.	Albert College	Bert Howard
Charlottetown, P. E. I.	St. Dunstan's College	J. A. Murphy
Edmonton, Alta.	University of Alberta	W. A. R. Kerr
Fredericton, N. B.	University of New Brunswick	C. C. Jones
Halifax, N. S.	Dalhousie University	Carleton Stanley
Halifax, N. S.	Halifax Ladies College	E. Florence Blackwood
Halifax, N. S.	University of King's College	A. Stanley Walker
Hamilton, Ont.	McMaster University	H. P. Whidden, Chancellor
Kingston, Ont.	Queen's University	R. C. Wallace*
Kitchener, Ont.	St. Jerome's College	Wm. G. Borho
Lennoxville, Que.	Bishop's University	A. H. McGreer*
London, Ont.	University of Western Ontario	Wm. Sherwood Fox
Montreal, Que.	Loyola College	H. C. McCarthy
Montreal, Que.	McGill University	Lewis W. Douglas
Quebec, Que.	Laval University	Camille Roy
St. Joseph, N. B.	St. Joseph's University	L. LaPalme
St. Thomas, Ont.	Alma College	P. S. Dobson*
Saskatoon, Sask.	University of Saskatchewan	James S. Thomson
Stanstead, Que.	Stanstead Wesleyan College	E. C. Amaron*
Toronto, Ont.	University of Toronto	H. J. Cody
Toronto, Ont.	Victoria University	E. W. Wallace
Truro, N. S.	Nova Scotia Agricultural College	Lyman T. Chapman
Vancouver, B. C.	University of British Columbia	Leonard S. Klinck
Winnipeg, Man.	University of Manitoba	Sidney E. Smith
Winnipeg, Man.	Wesley College	John H. Riddell
Wolfville, N. S.	Acadia University	F. W. Patterson

SECTION XIV
PRESIDENTS OF JUNIOR COLLEGES

City	Institution	President
Alabama		
Marion	Marion Institute	Walter I. Murfee
St. Bernard	St. Bernard Junior College	Ambrose Reger
Arizona		
Phoenix	Phoenix Junior College	E. W. Montgomery
Thatcher	Gila Junior College	E. Edgar Fuller
Arkansas		
Conway	Central College	J. S. Rogers
Fort Smith	Fort Smith Junior College	J. W. Ramsey
Jonesboro	Jonesboro Baptist College	
Little Rock	Little Rock Junior College	J. A. Larson
Magnolia	State Agricultural & Mechanical College	C. A. Overstreet
Monticello	Arkansas Agricultural & Mechanical College	Marvin Bankston
Russellville	Arkansas Polytechnic College	J. W. Hull
California		
Arlington	Southern California Junior College	E. E. Cossentine
Azusa	Citrus Junior College	F. S. Hayden
Bakersfield	Bakersfield Junior College	Grace V. Bird
Berkeley	Armstrong College	J. Evan Armstrong
Berkeley	Williams Institute	Cora L. Williams
Brawley	Brawley Junior College	Percy E. Palmer
Coalinga	Coalinga Extension Center	T. A. Ellestad, Dean
Compton	Compton Junior College	O. Scott Thompson
El Centro	Central Junior College	Guy A. Weakley
Fresno	Fresno Technical Junior College	Wm. A. Otto
Fullerton	Fullerton Junior College	Louis E. Plummer
Glendale	Glendale Junior College	Charles A. Nelson
Hollister	San Benito County Junior College	James P. Davis
Kentfield	Marin Junior College	A. C. Olney
Lancaster	Antelope Valley Junior College	Roy A. Knapp
Long Beach	Long Beach Junior College	John L. Lounsbury
Los Angeles	Los Angeles Junior College	Rosco C. Ingalls
Los Angeles	Los Angeles Pacific College	Byron S. Lamson
Marysville	Yuba County Junior College	Pedro Osuna, Dean
Modesto	Modesto Junior College	D. C. Baker
Ontario	Chaffey Junior College	Gardiner W. Spring
Pasadena	Pasadena Junior College	John W. Harbeson
Pomona	Pomona Junior College	J. E. Walker
Porterville	Porterville Junior College	B. H. Grisemer
Reedley	Reedley Junior College	J. O. McLaughlin
Riverside	Riverside Junior College	A. G. Paul
Sacramento	Sacramento Junior College	J. B. Lillard
Salinas	Salinas Junior College	Richard J. Werner
San Bernardino	San Bernardino Valley Union Junior College	Nicholas Ricciardi
San Diego	San Diego Junior College	Walter R. Hepner
San Francisco	Cogswell Polytechnical College	George B. Miller
San Luis Obispo	California Polytechnic School	Julian A. McPhee
San Mateo	San Mateo Junior College	Charles S. Morris
Santa Ana	Santa Ana Junior College	D. K. Hammond
Santa Monica	Santa Monica Junior College	Ralph H. Bush
Santa Rosa	Santa Rosa Junior College	Floyd P. Bailey
Susanville	Lassen Junior College	N. H. McCullom
Taft	Taft Junior College	Stanford Hannah
Ventura	Ventura Junior College	D. R. Henry
Visalia	Visalia Junior College	L. J. Williams
Colorado		
Denver	Colorado Vocational College	Rolland M. Shreves
Denver	Colorado Woman's College	J. E. Hutchingson
Grand Junction	Mesa College	Horace J. Wubben
Trinidad	Trinidad State Junior College	William R. Ross
Connecticut		
Bridgeport	Junior College of Connecticut	E. Everett Cortright
New Haven	Larson Junior College	George V. Larson
Thompson	Marot Junior College	Mary L. Marot
District of Columbia		
Washington	Arlington Hall Junior College for Girls	Carrie Sutherlin
Washington	Marjorie Webster Schools, Inc.	Marjorie Webster
Florida		
St. Petersburg	St. Petersburg Junior College	Robert B. Reed
Sarasota	Ringling Junior College	Verman Kimbrough
Georgia		
Augusta	Junior College of Augusta	J. L. Skinner
Barnesville	Gordon Military College	J. E. Guillebeau
Carrollton	West Georgia College	I. S. Ingram
Cochran	Middle Georgia College	L. H. Browning
College Park	Cox College	William S. Cox
Cuthbert	Andrew College	S. C. Olliff
Dahlonega	North Georgia College	Jonathan C. Rogers
Douglas	South Georgia College	J. M. Thrash
Milledgeville	Georgia Military College	G. S. Roach
Mount Vernon	Brewton-Parker Junior College	A. M. Gates
Norman Park	Norman Junior College	Paul Carroll
Tifton	Abraham Baldwin Agricultural College	G. W. King
Waleska	Reinhardt College	W. M. Bratton
Young Harris	Young L. G. Harris College	T. Jack Lance
Idaho		
Boise	Boise Junior College	Eugene B. Chaffee
Coeur d'Alene	Coeur d'Alene Junior College	Orrin E. Lee
Pocatello	University of Idaho, Southern Branch	J. R. Nichols, Exec. Dean
Rexburg	Ricks College	Hyrum Manwaring
Illinois		
Carlinville	Blackburn College	William M. Hudson
Chicago	Chicago Christian College	Frederick H. Wezeman
Chicago	Herzl City Junior College	H. J. Coppock, Acting Dean
Chicago	North Park College	Algoth Ohlson
Chicago	Wilson City Junior College	Butler Laughlin
Chicago	Wright City Junior College	W. H. Conley, Dean
Cicero	Morton Junior College	L. R. Hrudka
Godfrey	Monticello College	George I. Rohrbough
Harvey	Thornton Junior College	William E. McVey
Joliet	Joliet Junior College	W. W. Haggard
La Grange	Lyons Township Junior College	G. W. Willett
La Salle	La Salle-Peru-Oglesby Junior College	Frank A. Jensen
Lincoln	Lincoln College	Wm. D. Copeland
Mt. Carroll	Frances Shimer Junior College	Raymond B. Culver
Oak Park	Oak Park Junior College	T. P. Carpenter
Quincy	Quincy College	John Koebele
Springfield	Springfield Junior College	Walter Wilkins, Dean
Wilmette	Mallinkrodt College	Mother Sebastian
Indiana		
Collegeville	St. Joseph's College	Cyril F. Knue
Fort Wayne	Concordia College	Ottomar Krueger
Gary	Gary Junior College	Albert Fertsch, V. Pres.
Kokomo	Kokomo Junior College	H. A. Urake
Vincennes	Vincennes University	Walter A. Davis

City	Institution	President
Iowa		
Albia	Albia Junior College	John S. Chambers, Dean
Bloomfield	Bloomfield Junior College	H. Ostergaard
Boone	Boone Junior College	J. R. Thorngren
Britt	Britt Junior College	L. J. Thies
Burlington	Burlington Junior College	Ray H. Bracewell
Cedar Rapids	Mount Mercy Junior College	Sister Mary Xavier
Centerville	Centerville Junior College	E. Wayne Hilmer
Chariton	Chariton Junior College	F. A. Lunan, Dean
Clarinda	Clarinda Junior College	Herbert L. Glynn, Dean
Clinton	Mount St. Clare Junior College	Mother M. Paul Carrico
Creston	Creston Junior College	V. I. Sanders, Dean
Des Moines	Grand View College	C. Arild Olsen
Eagle Grove	Eagle Grove Junior College	Gerald Shepherd, Dean
Elkader	Elkader Junior College	D. L. Wood
Emmettsburg	Emmettsburg Junior College	R. W. Newell
Estherville	Estherville Junior College	N. E. Demoney
Forest City	Waldorf College	J. L. Rendahl
Fort Dodge	Fort Dodge Junior College	Harris Dickey, Dean
Hopkinton	Lenox College	E. V. Laughlin
Independence	Independence Junior College	F. E. Mueller, Dean
Iowa Falls	Ellsworth Junior College	Sheridan R. Jones
Lamoni	Graceland College	G. N. Briggs
Maquoketa	Maquoketa Junior College	E. L. Miller, Dean
Mason City	Mason City Junior College	James Rae
Muscatine	Muscatine Junior College	Willetta Strahan, Dean
Orange City	Northwestern Junior College	Jacob Heemstra
Osceola	Osceola Junior College	Lillian V. Hjort, Dean
Ottumwa	Ottumwa Heights College	Mother Geraldine Upham
Red Oak	Red Oak Public Junior College	J. R. Inman
Sioux City	Briar Cliff Junior College	Sister Mary Servatius
Tipton	Tipton Junior College	
Washington	Washington Junior College	Harland W. Mead
Waukon	Waukon Junior College	B. K. Orr
Webster City	Webster City Junior College	Harry L. Rice, Dean
Kansas		
Arkansas City	Arkansas City Junior College	E. A. Funk
Coffeyville	Coffeyville Junior College	W. M. Ostenberg, Dean
El Dorado	El Dorado Junior College	Earl Walker, Dean
Fort Scott	Fort Scott Junior College	W. S. Davison, Dean
Garden City	Garden City Junior College	Ira O. Scott
Haviland	Friends Bible College	Charles A. Beals
Hesston	Hesston College & Bible School	Milo Kauffman
Highland	Highland College	C. M. Rankin
Hutchinson	Hutchinson Junior College	C. M. Lockman, Dean
Independence	Independence Junior College	E. R. Stevens
Iola	Iola Junior College	R. H. Carpenter
Kansas City	Kansas City, Kansas Junior College	J. F. Wellemeyer
McPherson	Central Academy & College	Charles A. Stoll
Paola	College of Paola	Mother Jerome Schaub
Parsons	Parsons Junior College	E. F. Farner, Dean
Winfield	St. John's Lutheran College	Carl S. Mundinger
Kentucky		
Campbellsville	Campbellsville College	D. J. Wright
Columbia	Lindsey-Wilson Junior College	A. P. White
Covington	Villa Madonna College	M. Leick
Hopkinsville	Bethel Woman's College	J. W. Gaines
Jackson	Lees Junior College	J. O. Van Meter
London	Sue Bennett College	K. C. East
Louisville	Sacred Heart College	Sister M. Dominica, Dean
Maple Mount	Mount St. Joseph Junior College	Sister M. C. Eckmans, Dean
Nazareth	Nazareth Junior College	Sister Margaret Gertrude, Dean
Paducah	Paducah Junior College	R. G. Matheson, Jr., Dean
Pikeville	Pikeville College	Frank D. McClelland
Pippapass	Caney Junior College	Alice S. G. Lloyd
St. Catherine	St. Catherine Junior College	Mother Mary Louis
St. Mary	St. Mary's College	Francis J. Jaglowicz
Williamsburg	Cumberland College	James L. Creech
Louisiana		
Grand Coteau	Normal College of Sacred Heart	Mother Fitzwilliam
Hammond	Southeastern Louisiana College	J. Leon Clark
Lafayette	De La Salle Normal School	Brother A. Arsenius
Monroe	Northeast Center, L. S. U.	C. C. Colvert, Dean
Shreveport	Dodd College	E. C. Solomon
Shreveport	St. Vincent's College	Sister Mary Stanislaus, Dean
Maine		
Portland	Westbrook Junior College	Milton D. Proctor
Springvale	Nasson College	Dawn N. Wallace
Maryland		
Catonsville	St. Charles College	George A. Gleason
St. Mary's City	St. Mary's Female Seminary	M. Adele France
Massachusetts		
Auburndale	Lasell Junior College	Guy M. Winslow
Bradford	Bradford Junior College	Katharine M. Denworth
Dudley	Nichols Junior College	James L. Conrad
Wellesley	Pine Manor Junior College	Marie W. Potter
Michigan		
Adrian	St. Joseph's College & Academy	Mother M. Gerald
Bay City	Bay City Junior College	George E. Butterfield
Flint	Flint Junior College	W. S. Shattuck
Grand Rapids	Catholic Junior College	A. F. Bukowski
Grand Rapids	Grand Rapids Junior College	Arthur Andrews
Highland Park	Highland Park Junior College	George I. Altenburg, Dean
Ironwood	Ironwood Junior College	R. Ernest Dear, Dean
Jackson	Jackson Junior College	H. A. Steele
Muskegon	Muskegon Junior College	A. G. Umbreit
Pontiac	Pontiac Junior College	John Thors, Jr.
Port Huron	Port Huron Junior College	John H. McKenzie
Spring Arbor	Spring Arbor Seminary & Junior College	LeRoy M. Lowell
Minnesota		
Coleraine	Itasca Junior College	Gertrude Huntley, Acting Dean
Duluth	Duluth Junior College	R. D. Chadwick, Dean
Ely	Ely Junior College	S. F. Olson
Eveleth	Eveleth Junior College	O. H. Gibson
Hibbing	Hibbing Junior College	H. A. Drescher
Rochester	Rochester Junior College	R. W. Goddard
St. Paul	Concordia College	Martin Graebner
Virginia	Virginia Junior College	Floyd B. Moe, Dean
Mississippi		
Brookhaven	Whitworth College	G. F. Winfield
Clinton	Hillman College	M. P. L. Berry
Decatur	East Central Junior College	L. O. Todd
Ellisville	Jones County Junior College	M. P. Bush
Goodman	Holmes Junior College	M. McDaniel
Grenada	Grenada College	W. C. Newman
Gulfport	Gulf Park College	Richard G. Cox
Holly Springs	Mississippi Synodical College	R. F. Cooper
Mathiston	Wood Junior College	Jasper Weber
Moorhead	Sunflower Junior College	Paul M. West
Newton	Clarke Memorial College	W. L. McMullan
Perkinston	Harrison-Stone-Jackson Junior College	C. J. Darby
Poplarville	Pearl River Junior College	R. E. L. Sutherland
Raymond	Hinds Junior College	G. J. Cain
Scooba	East Mississippi Junior College	J. D. Wallace
Senatobia	Northwest Mississippi Junior College	S. R. Deen
Summit	Southwest Mississippi Junior College	J. M. Kenna
Vicksburg	All Saints Episcopal College	W. G. Christian
Wesson	Copiah-Lincoln Junior College	James M. Ewing
Missouri		
Bolivar	Southwest Baptist College	Courts Redford
Cameron	Inter-County Junior College	A. L. Jones
Columbia	Christian College	Eugene S. Briggs
Columbia	Stephens College	James M. Wood
Conception	Conception Junior College	Stephen Schappler
Concordia	St. Paul's College	L. W. Spitz, Acting
Flat River	Flat River Junior College	Irvin F. Coyle, Dean
Fulton	William Woods College	H. G. Harmon
Hannibal	Hannibal-La Grange College	Andrew F. Morris
Iberia	Iberia Junior College	G. Byron Smith
Jefferson City	Jefferson City Junior College	G. J. Linker
Kansas City	Junior College of Kansas City	A. M. Swanson, Acting
Kansas City	St. Teresa's Junior College	Sister Marcella
Kansas City	University of Kansas City	I. D. Spaeth
Kansas City	Western College	
Moberly	Moberly Junior College	M. A. Spohrer, Dean

City	Institution	President
Monett	Monett Junior College	M. L. Coleman
Nevada	Cottey College	Florence E. Boehmer
St. Joseph	St. Joseph Junior College	Nelle Blum
St. Louis	Notre Dame Junior College	Sister Mary Chrysologa
Trenton	Trenton Junior College	S. M. Rissler
Warrenton	Central Wesleyan College	Franklin F. Lewis

Montana

Havre	Northern Montana College	G. H. Vande Bogart

Nebraska

Hebron	Hebron College and Academy	W. H. Roselius, Acting
McCook	McCook Junior College	J. E. Shedd
Scottsbluff	Scottsbluff Junior College	Archer L. Burnham
Wahoo	Luther College	Paul M. Lindberg

New Hampshire

New London	Colby Junior College	H. Leslie Sawyer

New Jersey

Hackettstown	Centenary Junior College	Robert J. Trevorrow
Long Branch	Monmouth Junior College	Edward G. Schlaefer, Dean
Morristown	Morris Junior College	Arthur S. Platt
Perth Amboy	Middlesex Junior College	Ladd Lukats, Dean
Roselle	Union County Junior College	Charles G. Cole, Dean
Teaneck	Junior College of Bergen County	C. L. Littel
Zarephath	Alma White College	Arthur K. Uhite

New Mexico

Portales	Eastern New Mexico Junior College	Donald W. Mackay

New York

Briarcliff Manor	Briarcliff Junior College	Doris L. Flick
Bronxville	Concordia Collegiate Institute	Arthur J. Doege
North Chili	A. M. Chesbrough Seminary	Merlin G. Smith

North Carolina

Banner Elk	Lees-McRae College	Edgar H. Tufts
Belmont	Belmont Abbey College	Cuthbert Allen, Rector
Boiling Springs	Boiling Springs College	J. C. Burnett
Brevard	Brevard College	Eugene J. Coltrane
Buies Creek	Campbell College	L. H. Campbell
Louisburg	Louisburg College	D. E. Earnhardt
Mars Hill	Mars Hill College	Robert Lee Moore
Maxton	Presbyterian Junior College for Men	R. G. Matheson, Jr.
Misenheimer	Pfeiffer Junior College	W. S. Sharp
Montreat	Montreat College	R. C. Anderson
Murfreesboro	Chowan Junior College	J. L. Carrick
Raleigh	Peace Junior College	William C. Pressly
Raleigh	St. Mary's School & Junior College	Mrs. Ernest Cruikshank
Rutherford College	Rutherford College	L. S. Weaver
Salemburg	Pineland Junior College	W. J. Jones
Statesville	Mitchell College	Mrs. W. B. Ramsay
Wingate	Wingate Junior College	C. C. Burris

North Dakota

Bottineau	North Dakota School of Forestry	Raymond W. McLees
Wahpeton	North Dakota State School of Science	E. F. Riley

Ohio

Rio Grande	Rio Grande College	William A. Lewis
Urbana	Urbana Junior College	Russell Eaton

Oklahoma

Altus	Altus Junior College	A. G. Steele
Bacone	Bacone College	B. D. Weeks
Bartlesville	Bartlesville Junior College	Paul C. Norvell
Bristow	Bristow Junior College	E. H. Black
Claremore	Oklahoma Military Academy	Walter E. Downs
Durant	Oklahoma Presbyterian College	Andrew Bramlett
Lawton	Cameron State Agricultural College	Charles M. Conwill
Miami	Northeastern Oklahoma Junior College	E. L. Smith
Muskogee	Muskogee Junior College	Bessie M. Huff, Dean
Okmulgee	Okmulgee Junior College	W. Max Chambers
Seminole	Seminole Junior College	John G. Mitchell
Tishomingo	Murray State School of Agriculture	Clive E. Murray
Tonkawa	University Preparatory School & Junior College	R. R. Robinson
Tulsa	Monte Cassino Junior College	Sister M. Hildegarde
Warner	Connors State Agricultural College	Jacob Johnson
Wetumka	Wetumka Junior College	G. S. Sanders
Wilburton	Eastern Oklahoma College	Ohland Morton
Woodward	Woodward Junior College	R. R. Russell

Pennsylvania

Bryn Mawr	Harcum Junior College	Edith L. Harcum
Cambridge Springs	Alliance College	John J. Kolasa
Chambersburg	Penn Hall Junior College & Preparatory School	Frank S. Magill
La Plume	Scranton-Keystone Junior College	Byron S. Hollinshead
Lititz	Linden Hall Junior College	F. W. Stengel
Swarthmore	Wildcliff Junior College	H. M. Crist

South Carolina

Anderson	Anderson College	Annie D. Denmark
Central	Wesleyan Methodist College	John F. Childs
Spartanburg	Textile Industrial Institute	R. B. Burgess

South Dakota

Freeman	Freeman Junior College	John D. Unruh
Mitchell	Notre Dame Junior College	J. M. Brady
Wessington Springs	Wessington Springs Junior College	W. A. Harden

Tennessee

Athens	Tennessee Wesleyan College	James L. Robb
Henderson	Freed-Hardeman College	N. B. Hardeman
Madisonville	Hiwassee College	T. A. Frick
Nashville	David Lipscomb College	E. H. Ijams
Nashville	Trevecca Nazarene College	A. B. Mackey
Nashville	Ward Belmont	A. B. Benedict
Pulaski	Martin College	Keener L. Rudolph
Rogersville	Swift Memorial Junior College	W. C. Hargrave

Texas

Amarillo	Amarillo College	J. F. Mead
Arlington	North Texas Agricultural College	E. E. Davis, Dean
Beaumont	Lamar College	C. W. Bingman
Brownsville	Brownsville Junior College	E. C. Dodd
Clarendon	Clarendon Junior College	H. T. Burton
Clifton	Clifton Junior College	S. F. Veldey
Decatur	Decatur Baptist College	J. L. Ward
Edinburg	Edinburg Junior College	R. P. Ward
Fort Worth	Our Lady of Victory College & Academy	Sister Frances Regis
Gainesville	Gainesville Junior College	H. O. McCain
Greenville	Wesley College	J. Garland Roach
Hillsboro	Hillsboro College	L. W. Hartsfield
Houston	University of Houston	E. E. Oberholtzer
Jacksonville	Jacksonville College	J. W. Overall
Jacksonville	Lon Morris College	C. E. Peeples
Keene	Southwestern Junior College	H. H. Hamilton
Kerrville	Schreiner Institute	J. J. Delaney
Marshall	College of Marshall	F. S. Groner
Paris	Paris Junior College	J. R. McLemore
Plainview	Wayland College	G. W. McDonald
Ranger	Ranger Junior College	William T. Walton
San Angelo	San Angelo College	Felix E. Smith
Seguin	Texas Lutheran College	Wm. F. Kraushaar
Stephenville	John Tarleton Agricultural College	J. Thomas Davis, Dean
Tehuacana	Westminster College	Clarence A. Sutton
Temple	Temple Junior College	L. C. Procter

City	Institution	President
Terrell	Texas Military College	Mrs. Louis C. Perry
Texarkana	Texarkana College	H. W. Stilwell
Tyler	Tyler Junior College	J. M. Hodyer
Victoria	Victoria Junior College	P. S. Garner
Weatherford	Weatherford College	G. C. Boswell
Wichita Falls	Hardin Junior College	H. D. Fillers

Utah

Ephraim	Snow College	James A. Nuttall
Ogden	Weber College	H. A. Dixon
Salt Lake City	Westminster College	H. W. Reherd

Vermont

Poultney	Green Mountain Junior College	Jesse P. Bogue

Virginia

Blackstone	Blackstone College for Girls	J. Paul Glick
Bluefield	Bluefield College	Edwin C. Wade
Bristol	Sullins College	W. E. Martin
Bristol	Virginia Intermont College	H. G. Noffsinger
Buena Vista	Southern Seminary & Junior College	Robert Lee Durham
Danville	Averett College	Curtis Bishop
Danville	Stratford College	John C. Simpson
Dayton	Shenandoah College	Wade S. Miller
Harrisonburg	Eastern Mennonite School	John L. Stauffer, Acting
Marion	Marion College	E. H. Copenhaver
Petersburg	Southern College	Arthur K. Davis

Washington

Aberdeen	Grays Harbor Junior College	W. R. Bartmess
Centralia	Centralia Junior College	Margaret Corbet
Lacey	St. Martin's College	Lambert Burton
Mount Vernon	Mount Vernon Junior College	Charles H. Lewis
Parkland	Pacific Lutheran College	O. A. Tingelstad
Spokane	Spokane Junior College	G. H. Schlauch
Yakima	Yakima Valley Junior College	Elizabeth A. Prior

West Virginia

Beckley	Beckley College	J. L. Blumgardner
Charleston	Kanawha College	L. S. McDaniel
Keyser	Potomac State School	E. E. Church
Lewisburg	Greenbrier College	F. W. Thompson
Philippi	Alderson-Broaddus Junior College	H. D. Pickett, Acting

Wisconsin

Milwaukee	Concordia College	L. C. Rincker
Mt. Calvary	St. Lawrence Junior College	Alexis Gore
St. Nazianz	Salvatorian Seminary	Edwin Buers

Canal Zone

Balboa	Canal Zone Junior College	Fred Hosler, Dean

Canada

Calgary, Alta.	Mount Royal Junior College	George W. Kerby

SECTION XV
HEADS OF PRIVATE SCHOOLS

City	Institution	Head
Alabama		
Anniston	Alabama Military Institute	E. B. Fishburne
Birmingham	The Simpson School	J. M. Malone
Fairhope	School of Organic Education	Marietta Johnson
Mobile	University Military School	William S. Pape
Thorsby	Thorsby Institute	Helen C. Jenkins
California		
Berkeley	Anna Head School	Mary E. Wilson
Beverly Hills	Berkeley Hall School	Mary E. Stevens
Claremont	Webb School of California	Thompson Webb
Culver City	Pacific Military Academy	Rufus A. Palm, Supt.
La Jolla	The Bishop's School	Caroline S. Cummins
Los Angeles	Cumnock School	Raymond C. Brooks
Los Angeles	Marlborough School for Girls	Ada S. Blake
Los Angeles	Urban School for Boys, Ltd.	P. G. McDonnell
Los Angeles	Westlake School for Girls	Miss J. S. Vance
Los Gatos	Montezuma School for Boys	Howard R. Porter
Menlo Park	Menlo School and Junior College	Lowry S. Howard
North Hollywood	Harvard School	Robert B. Gooden
Pacific Beach	Brown Military Academy	Charles Bain
Palo Alto	Castilleja School	Mary I. Lockey
Palo Alto	Miss Harker's School for Girls	Catherine Harker
Pasadena	Westridge School for Girls	Mary L. Ranney
San Francisco	Miss Burke's School	Barbara Burke
San Francisco	Drew School	John S. Drew
San Francisco	Sarah Dix Hamlin School	Mrs. E. B. Stanwood
San Rafael	San Rafael Military Academy	A. L. Stewart
San Rafael	The Tamalpais School	F. J. Daly
Santa Barbara	Santa Barbara Girls School	E. Gertrude Gogin
Colorado		
Colorado Springs	Fountain Valley School	Francis Mitchell Froelicher
Denver	Kent School for Girls	Mary L. Rathvon, M. A. Bogue
Connecticut		
Avon	Avon Old Farms	Percy G. Kammerer
Bloomfield	St. Thomas Seminary	Henry O'Brien
Cheshire	Cheshire Academy	Arthur N. Sheriff
Clinton	Morgan School	George L. Scott
Farmington	Miss Porter's School	Robert Porter Keep
Greenwich	Brunswick School	Thomas C. Burton
Greenwich	The Edgewood School	Euphrosyne Langley
Greenwich	Greenwich Academy	Ruth West Campbell
Greenwich	Rosemary Hall	C. Ruutz-Rees
Hartford	Oxford School	Edith N. Evans, Acting
Kent	Kent School	Frederick H. Sill
Lakeville	Hotchkiss School	George Van Santvoord
Middlebury	Westover School	Louise B. Dillingham
Milford	The Milford School	Paul D. Shafer
New Haven	Collegiate School	Arthur Pite
New Haven	Mrs. Day's School	Elizabeth L. Day
New Haven	Hamden Hall Country Day School	E. Stanley Taylor
New Haven	Hopkins Grammar School	George B. Lovell
New London	Bulkeley School	Homer K. Underwood
New London	Williams Memorial Institute	Colin S. Buell
New Milford	Canterbury School	Nelson Hume
Norwalk	Hillside Country School	Margaret R. Brendlinger
Norwich	Norwich Free Academy	Henry A. Terrell
Pomfret	Pomfret School	Halleck Lefferts
Rowayton	The Thomas School	Mabel Thomas
Salisbury	Salisbury School	Emerson B. Quaile
Simsbury	Ethel Walker School	Jessie G. Hewitt
Simsbury	Westminster School	Arthur Milliken
South Kent	South Kent School	Samuel S. Bartlett
Stamford	The King School	V. A. Dwelle
Stamford	Low-Heywood School	Mary R. Roper
Suffield	Suffield Academy	Brownell Gage
Wallingford	The Choate School	George C. St. John
Washington	The Gunnery School	Tertius van Dyke
Washington	Wykeham Rise School, Inc.	Fanny E. Davies
Waterbury	St. Margaret's School	Alberta C. Edell
Watertown	The Taft School	Paul F. Cruikshank
West Hartford	Kingswood School	G. R. H. Nicholson
Windsor	The Loomis School	N. H. Batchelder
Winsted	The Gilbert School	Henry S. Moseley
Delaware		
Middletown	St. Andrew's School	Walden Pell 2nd
Wilmington	Friends School	Wilmot R. Jones
Wilmington	Tower Hill School	Burton P. Fowler
District of Columbia		
Washington	Academy of the Holy Cross	Sister M. Rose Elizabeth
Washington	Chevy Chase School	Mrs. Frederic E. Farrington, Regent
Washington	Devitt School	J. F. Byerly
Washington	Dunbarton College & Holy Cross Academy	Sister M. Rose Elizabeth
Washington	Emerson Institute	Winslow H. Randolph
Washington	Fairmont School & Junior College	Maud van Woy
Washington	Georgetown Visitation Convent	Sister M. Sheerin
Washington	Gunston Hall	Mary L. Gildersleeve
Washington	Holton-Arms School, Inc.	Jessie M. Holton
Washington	Immaculata Seminary	Sister Mary Genevieve
Washington	Mt. Vernon Seminary	Jean Dean Cole
Washington	National Cathedral School	Mabel B. Turner
Washington	St. Albans	Albert H. Lucas
Washington	Sidwell Friends School	Albert E. Rogers
Florida		
Jacksonville	The Bolles School	Roger M. Painter
Miami	The Cate School	W. B. Cate
Miami	Miss Harris, Florida School	Julia F. Harris
Miami Beach	Coburn Country Day School	Nelson Coburn
Orlando	Cathedral School for Girls	John Durham Wing
Palm Beach	Palm Beach Private School	Karl B. Dearborn
St. Leo	St. Leo College Prep School	Francis Sadlier
St. Petersburg	Aikin Open Air School	Mrs. Maude Aikin
St. Petersburg	Florida Military Academy	W. B. Mendels
Georgia		
Atlanta	North Avenue Presbyterian School	Thyrza S. Askew
Atlanta	University School for Boys	W. E. Dendy
Atlanta	Washington Seminary	Llewellyn D. Scott
College Park	Georgia Military Academy	J. C. Woodward
Gainesville	Riverside Military Academy	Sandy Beaver
Oxford	Emory at Oxford	George F. Roach
Rome	Darlington School	C. R. Wilcox
Savannah	Pape School	Nina A. Pape
Illinois		
Aledo	Roosevelt Military Academy	Karl J. Stouffer
Alton	Western Military Academy	R. L. Jackson
Chicago	Chicago Latin School	James O. Wood
Chicago	Faulkner School for Girls	Elizabeth Faulkner
Chicago	The Girls Latin School of Chicago	Elizabeth Singleton
Chicago	Harvard School for Boys	Charles E. Pence
Chicago	Loring School	Cecilia Russell
Chicago	Luther Institute	John O. Anderson
Chicago	Morgan Park Military Academy	Harry D. Abells
Chicago	Francis W. Parker School	Raymond W. Osborne
Chicago	Starrett School for Girls	Gerard T. Smith
Chicago	Stickney School	Stanley M. Durrant

City	Institution	Head
Chicago	University High School	P. B. Jacobsen
Elgin	Elgin Academy	Earl G. Leinbach
Evanston	Marywood School for Girls	Sister Superior
Evanston	Roycemore School	Rebecca S. Ashley
La Grange	Broadview Academy	A. J. Olson
Lake Forest	Ferry Hall	Eloise R. Tremain
Lake Forest	Lake Forest Academy	John W. Richards
Mooseheart	Mooseheart School	W. J. Leinweber
Onarga	Onarga Military School	J. E. Bittinger, Supt.
Rock Island	Villa De Chantal	Sister Marie
Sycamore	St. Alban's School	Charles L. Street
Winnetka	The North Shore Country Day School	Perry D. Smith

Indiana

Culver	Culver Military Academy	L. R. Gignilliat
Howe	Howe School	Burrett B. Bouton
Indianapolis	Tudor Hall School for Girls, Inc.	I. Hilda Stewart

Iowa

Dubuque	Columbia Academy	Thomas Conry

Kansas

Salina	St. John's Military School	R. L. Clem, Supt.

Kentucky

Lexington	Sayre School for Girls	J. C. Hanley
Louisville	Kentucky Home School for Girls	Annie S. Anderson
Louisville	Louisville Collegiate School	Marjorie Hiscox
Lyndon	Kentucky Military Institute	Charles B. Richmond
Millersburg	Millersburg Military Institute	W. R. Nelson
Shelbyville	Science Hill School	Juliet J. Poynter

Louisiana

New Orleans	Gilbert Academy	Margaret Davis Bowen
New Orleans	Louise S. McGehee School	Nina P. Davis, Acting
New Orleans	Metairie Park Country Day School	Ralph E. Boothby
New Orleans	Isidore Newman School	C. C. Henson

Maine

Bethel	Gould Academy	Philip S. Sayles
Charleston	Higgins Classical Institute	Wm. A. Tracy
Dover-Foxcroft	Foxcroft Academy	Frank G. Stone
Fryeburg	Fryeburg Academy	Elroy O. LaCasce
Hebron	Hebron Academy	Ralph L. Hunt
Houlton	Ricker Classical Institute & Junior College	R. M. Hayes
Kents Hill	Kents Hill School	Edward W. Hincks
North Bridgton	Bridgton Academy	H. H. Sampson
Pittsfield	Maine Central Institute	Edwin M. Purinton
Portland	The Waynflete School	Barbara B. Woodruff
Saco	Thornton Academy	Hollis A. Sanderson
South Berwick	Berwick Academy	Ercell M. Gordon
Vassalboro	Oak Grove School	Robert E. Owen
Waterville	Coburn Classical Institute	Hugh A. Smith

Maryland

Baltimore	Boys' Latin School	Frederick A. Hahn
Baltimore	The Bryn Mawr School	Janet H. Clark
Baltimore	Friends School	Edwin C. Zavitz
Baltimore	Gilman Country School	E. Boyd Morrow
Baltimore	Maryland Latin School for Girls	Lillian M. Kloppel
Baltimore	Mount St. Agnes School	Sister Mary Kathleen
Baltimore	Mt. St. Joseph College High School	Brother Edmund
Baltimore	Notre Dame Preparatory School	Sister M. Ethelbert
Baltimore	The Park School	Hans Froelicher, Jr.
Baltimore	Roland Park Country School	Elizabeth M. Castle
Catonsville	St. Timothy's School	Ella R. Watkins
Charlotte Hall	Charlotte Hall School	B. F. Crowson
Forest Glen	National Park Seminary	James E. Ament
Garrett Park	Georgetown Preparatory School	Henri J. Wiesel
Garrison	Garrison Forest School	Jean G. Marshall
Glencoe	Oldfields School, Inc.	Duncan McCulloch
McDonogh	McDonogh School	Louis E. Lamborn
Port Deposit	The Tome School	Charles J. Keppel
Reisterstown	The Hannah More Academy	Laura Fowler
Ruxton	Greenwood School	Mary A. Elcock
St. James	St. James School	Adrian H. Onderdonk
Severna Park	Severn School	Rolland M. Teel
Towson	Loyola High School	John J. Long

Massachusetts

Andover	Abbot Academy	Marguerite Hearsey
Andover	Phillips Academy	Claude Moore Fuess
Ashburnham	Cushing Academy	Clarence P. Quimby
Belmont	Belmont Hill School	Thomas R. Morse
Boston	Boston Academy of Notre Dame	Sister Superior
Boston	The Brimmer School	Mabel Cummings
Boston	Chauncy Hall School	Franklin T. Kurt
Boston	Erskine School	Euphemia E. McClintock
Boston	Huntington School for Boys	Charles H. Sampson
Boston	The May School	Mrs. Chas. H. Haskins
Boston	The Winsor School	Katharine Lord
Brookline	Choate School	Augusta Choate
Brookline	The Rivers School	Clarence E. Allen
Cambridge	The Brown & Nichols School	Geoffrey W. Lewis
Cambridge	The Buckingham School	Marian W. Vaillant
Cambridge	Manter Hall School	J. C. Hall
Cambridge	New Preparatory School	Ernest Benshimol
Chestnut Hill	The Beaver Country Day School	Eugene R. Smith
Concord	Concord Academy	Valeria A. Knapp
Concord	Middlesex School	Frederick Winsor
Danvers	St. John's Preparatory School	Brother Aubert
Dedham	Noble & Greenough School	Charles Wiggins
Deerfield	Deerfield Academy	Frank L. Boyden
Easthampton	Williston Academy	Archibald V. Galbraith
East Northfield	Northfield Seminary	Mira B. Wilson
Franklin	Dean Academy	Earle S. Wallace
Groton	Groton School	Endicott Peabody
Groton	Lawrence Academy	Fred Clifton Gray
Hingham	Derby Academy	George F. Cherry
Kendall Green	The Cambridge School, Inc.	John R. D. French
Lowell	Rogers Hall	Katharine W. McGay
Marion	Tabor Academy	Walter H. Lillard
Milton	Milton Academy	Wm. L. W. Field
Mt. Hermon	Mount Hermon School	David R. Porter
Natick	Walnut Hill School	Hester R. Davies
Newton	The Country Day School for Boys	W. Linwood Chase
North Andover	Brooks School	Frank D. Ashburn
Norton	House in the Pines	Mrs. G. C. Milliken
Pittsfield	Miss Hall's School	Margaret H. Hall, Acting
Sheffield	Berkshire School	Seaver B. Buck
Southborough	St. Mark's School	Francis Parkman
South Braintree	Thayer Academy	Stacy B. Southworth
South Byfield	Governor Dummer Academy	Edward W. Eames
Springfield	The MacDuffie School	M. A. MacDuffie
Wellesley	Academy of the Assumption	Sister Maris Stella
Wellesley	Dana Hall Schools	Helen Temple Cooke
West Bridgewater	Howard Seminary	Mrs. M. E. Peters
Weston	The Cambridge School	John R. P. French
West Roxbury	Roxbury Latin School	George N. Northrop
Wilbraham	Wilbraham Academy	Charles L. Stevens
Worcester	Bancroft School	Hope Fisher
Worcester	Worcester Academy	Harold H. Wade

Michigan

Bloomfield Hills	Cranbrook School	R. D. Lindquist
Bloomfield Hills	Kingswood School Cranbrook	Margaret A. Augur
Detroit	Detroit University School	Daniel H. Fletcher
Detroit	The Liggett School	Katharine Ogden
Detroit	Miss Newman's School	Mary Newman

Minnesota

Faribault	St. Mary's Hall	Katharine Caley
Faribault	Shattuck School	James S. Guernsey
Minneapolis	The Blake School	Eugene C. Alder
Minneapolis	Minnehaha Academy	J. S. Peterson
Minneapolis	Northrop Collegiate School	Ethel M. Spurr
Owatonna	Pillsbury Academy	Milo B. Price
St. Paul	Oak Hall	Royal A. Moore
St. Paul	St. Paul Academy	John DeQ. Briggs
St. Paul	The Summit School	Sarah Converse

Mississippi

Gulfport	Gulf Coast Military Academy	Nat Owen
Port Gibson	Chamberlain-Hunt Academy	J. W. Kennedy

City	Institution	Head
Missouri		
Boonville	Kemper Military School	A. M. Hitch
Clayton	John Burroughs School	Leonard D. Haertter
Clayton	Chaminade College Academy	V. B. Braun
Columbia	University High School	L. G. Townsend
Kansas City	Barstow School	M. Mercer Kendig
Kansas City	Pembroke-Country Day School	Howard A. Jones
Kansas City	Sunset Hill School for Girls	Mrs. Leland Hazard
Lexington	Wentworth Military Academy	J. M. Sellers, Supt.
Mexico	Missouri Military Academy	Charles R. Stribling
Point Lookout	The School of the Ozarks	Carl Cave
St. Louis	Mary Institute	Charles H. Garrison
St. Louis	The Principia	Frederic E. Morgan
St. Louis	St. Louis Country Day School	Robert H. B. Thompson
Nebraska		
Omaha	Brownell Hall	Marguerite H. Wickenden
Omaha	Pratt School of Individual Instruction, Inc.	Mrs. C. F. Pratt
New Hampshire		
Andover	Proctor Academy	Halsey Gulick
Center Strafford	Austin-Cate Academy	Clarence Cummings
Concord	St. Paul's School	Samuel S. Drury
Derry	Pinkerton Academy	John H. Bell
Exeter	Phillips Exeter Academy	Lewis Perry
Exeter	Robinson Seminary	James A. Pirnie
Kingston	Sanborn Seminary	Raymond A. Hoyt
Meriden	Kimball Union Academy	William R. Brewster
New Hampton	New Hampton	Frederick Smith
Tilton	Tilton School and Junior College	James E. Coons
Wolfeboro	Brewster Free Academy	Walter G. Grennall, Jr.
New Jersey		
Blairstown	Blair Academy	Charles H. Breed
Bordentown	Bordentown Military Institute	H. M. Smith, J. H. Lucas, & D. Styer
Burlington	St. Mary's Hall	Edith M. Weller
Convent	Academy of St. Elizabeth	Sister Marie Josephine
Elizabeth	Pingry School	E. Laurence Springer
Elizabeth	The Vail-Deane School	Eleanor Denison
Englewood	Dwight School	Frances Leggett
Essex Falls	Kingsley School	Walter D. Gerken
Gladstone	St. Bernard's School	H. D. Nicholls
Hightstown	Peddie School	Wilbur E. Saunders
Hoboken	Stevens Hoboken Academy	B. F. Carter
Jersey City	Bergen School for Girls	Louise W. Moora
Lakewood	Newman School	William M. Ayar
Lawrenceville	The Lawrenceville School	Allan V. Heely
Montclair	The Kimberley School	Mary K. Waring
Montclair	Montclair Academy	Walter D. Head
Moorestown	Moorestown Friends School	Chester L. Reagan
Morristown	Morristown School	George H. Tilghman
Newark	Newark Academy	Clinton F. Zerweck
Newark	Newark Preparatory School	Leon Terry
Newark	Prospect Hill Country Day School	Mrs. Laura D. Lamont
New Brunswick	Rutgers Preparatory School	Stanley Shepard, Jr.
Orange	Miss Beard's School	Lucie C. Beard
Orange	Carteret Academy	George G. Grim
Pennington	Pennington School	Francis Harvey Green
Plainfield	The Hartridge School	Emelyn B. Hartridge
Plainfield	Wardlaw School	C. D. Wardlaw
Princeton	Miss Fine's School	Katherine B. Shippen
Princeton	Hun School	John G. Hun
Summit	Kent Place School	Harriet L. Hunt
Toms River	Admiral Farragut Academy	S. S. Robison, Supt.
New Mexico		
Roswell	New Mexico Military Institute	D. C. Pearson
New York		
Albany	Academy of the Holy Names	Sister M. Judith
Albany	The Albany Academy	Islay F. McCormick
Albany	Albany Academy for Girls	Margaret Trotter
Albany	St. Agnes School	Blanche Pittman
Bronxville	Brantwood Hall	Mary T. Maine
Brooklyn	Adelphi Academy	William Slater
Brooklyn	Berkeley Institute	Ina C. Atwood
Brooklyn	Brooklyn Academy	Chas. W. Cortright
Brooklyn	Brooklyn Friends School	Douglas G. Grafflin
Brooklyn	Brooklyn Preparatory School	John H. Klocke
Brooklyn	Colby Academy	Walter S. Meyer
Brooklyn	The Packer Collegiate Institute	John H. Denbigh
Brooklyn	Polytechnic Preparatory Country Day School	Joseph Dana Allen
Brooklyn	Shore Road Academy	Theodora Goldsmith
Buffalo	The Buffalo Seminary	L. Gertrude Angell
Buffalo	The Franklin School	Bertha A. Keyes
Buffalo	Nichols School	Philip M. B. Boocock
Carmel	Drew Seminary for Young Women	Herbert Wright
Cazenovia	The Cazenovia Seminary	Harold W. Hebblethwaite
Cooperstown	Knox School	Mrs. E. Russell Houghton
Cornwall	New York Military Academy	Milton F. Davis
Dobbs Ferry	The Masters School	Evelina Pierce
Flushing	The Foxwood School	Elizabeth C. Dresser
Forest Hills	Kew-Forest School	Louis D. Marriott
Garden City	Cathedral School of St. Mary	Marion B. Reid
Garden City	St. Paul's School	Walter R. Marsh
Jackson Heights	Garden Country Day School	O. P. Flower
Lake Placid Club	Northwood School	Ira A. Flinner
Lakemont	Palmer Institute-Starkey Seminary	James P. Long
Lima	Genesee Wesleyan Seminary	C. W. Spangle, Dean
Locust Valley	Friends Academy	Alexander M. Blackburn
Manlius	Manlius School	Guido F. Verbeck
Millbrook	The Bennett School	Courtney Carroll
Montour Falls	Cook Academy	Bert C. Cate
New Hartford	Utica Country Day School	Raymond B. Johnson
New York	Academy Mount Saint Vincent	Frances E. Marra
New York	All Hallows Institute	P. A. Gleeson
New York	The Barnard School for Boys	William L. Hazen
New York	The Barnard School for Girls	Theodore E. Lyon
New York	Bentley School	Bertha M. Bentley
New York	The Berkeley-Irving School	Louis C. Woodruff
New York	Birch Wathen School	Louise Birch
New York	The Brearley School	Millicent Carey McIntosh
New York	The Calhoun School	Mary E. Calhoun
New York	The Chapin School, Ltd.	Ethel Stringfellow
New York	Collegiate School	Wilson Parkhill
New York	Columbia Grammar School	Frederic A. Alden
New York	The Dalton Schools, Inc.	Helen Parkhurst
New York	Ethical Culture Schools	V. T. Thayer
New York	Franklin School	Clifford W. Hall
New York	Friends Seminary	Henry L. Messner
New York	The Gardner School	M. Elizabeth Masland
New York	The Lenox School	Olivia Green
New York	Lincoln School of Teachers College	Lester Dix
New York	Horace Mann School	Rollo G. Reynolds
New York	Horace Mann School for Boys	Charles C. Tillinghast
New York	McBurney School	Thomas Hemenway
New York	New York Preparatory School	Ernest Greenwood
New York	Rhodes School	David Goodman
New York	The Riverside School	Margaret E. Wells
New York	St. Agatha	Muriel Bowden
New York	St. Ann's Academy	Brother Francis Michael
New York	Scudder School	James E. Lough
New York	The Spence School	Dorothy Brockway
New York	The Todhunter School	Marion Dickerman
New York	Trinity School	M. E. Dann
New York	Walden School	C. Elizabeth Goldsmith
Niagara Falls	DeVeaux School	George L. Barton, Jr.
Oakdale	La Salle Military Academy	Brother Leo
Pawling	Pawling School	R. J. Shortlidge
Peekskill	The Peekskill Military Academy	John C. Bucher
Peekskill	St. Mary's School	Sister Mary Regina
Poughkeepsie	Oakwood School	William J. Reagan
Riverdale	Riverdale Country School	Frank S. Hackett
Rochester	Allendale School	John R. Webster
Rochester	Columbia School	Mrs. D. E. Simpson
Rochester	The Harley School	Louise M. Sumner
Rye	Rye Country Day School	Morton Snyder
Scarborough	Scarborough School	F. Dean McClusky
Schenectady	The Brown School	Marjorie D. Simpson
Snyder	The Park School of Buffalo	M. A. Cheek, Jr.
Staten Island	Notre Dame Academy	Sister St. Margaret
Staten Island	Staten Island Academy	Stephen J. Botsford
Stony Brook	The Stony Brook School	Frank E. Gaebelein
Syracuse	Goodyear-Burlingame School	Marion S. Edwards
Tarrytown	The Hackley School	Walter B. Gage
Tarrytown	Highland Manor School & Junior College	Eugene H. Lehman
Tarrytown	Irving School	C. W. Olson
Tarrytown	Marymount School	M. St. Clare
Troy	Emma Willard School	Eliza Kellas
Troy	La Salle Institute	Brother Raymond
Woodmere	Woodmere Academy	Horace M. Perry

City	Institution	Head
North Carolina		
Asheville	Asheville School	David R. Fall
Asheville	St. Genevieve-of-the-Pines	Mother Foret
Beaufort	St. Paul's School	
Buie's Creek	Campbell College & Academy	L. H. Campbell
Hendersonville	Fassifern School	Joseph R. Sevier
Oak Ridge	Oak Ridge Military Institute	T. O. Wright
Star	Country Life Academy	E. F. Green
Winston Salem	Salem Academy	Mary A. Weaver
North Dakota		
Fargo	Oak Grove Seminary	T. H. Quenbeck
Ohio		
Akron	Old Trail School	Eugene M. Hinton
Barnesville	Friends Boarding School	Blanche E. Schofield
Cincinnati	College Preparatory School	Mary Harlan Doherty
Cincinnati	Hillsdale	Miriam Titcomb
Cincinnati	University School	C. L. S. Easton
Cleveland	Hathaway-Brown School	Mary E. Raymond
Cleveland	Laurel School	Edna F. Lake
Cleveland	The University School	Harry A. Peters
Columbus	The Columbus Academy	Frank P. R. Van Syckel
Columbus	The Columbus School for Girls	Mrs. C. F. W. McClure
Hudson	Western Reserve Academy	Joel B. Hayden
Mt. St. Joseph	Mt. St. Joseph Academy	Sister Dorothea
Mt. Vernon	Mt. Vernon Academy	V. P. Lovell
Reading	Mount Notre Dame Academy	Sister Genevieve Marie
Toledo	Maumee Valley Country Day School	Leslie Leland
Oregon		
Gaston	Laurelwood Academy	H. R. Miller
Portland	The Catlin School	Ruth Catlin
Portland	Hill Military Academy	Joseph A. Hill
Portland	St. Helen's Hall	Sisters of St. John Baptist
Pennsylvania		
Allentown	Allentown Preparatory School	Louis F. Hackemann
Ardmore	The Holman School	Elizabeth W. Braley
Birmingham	The Grier School	Thomas C. Grier
Bryn Mawr	The Baldwin School	Elizabeth F. Johnson
Bryn Mawr	The Shipley School	Alice G. Howland
Forty Fort	The Wilkes-Barre Institute	Oscar N. Barber
George School	George School	George A. Walton
Harrisburg	Harrisburg Academy	Arthur E. Brown
Haverford	Haverford School	Cornelius B. Boocock
Hollidaysburg	Highland Hall	Elizabeth G. Baldwin
Kingston	Wyoming Seminary	Wilbur H. Fleck
Lancaster	Franklin & Marshall Academy	E. M. Hartman
Lancaster	The Shippen School	Eleanor Fitzpatrick
Latrobe	St. Xavier Academy	Sister M. Gabriel
Mercersburg	The Mercersburg Academy	Boyd Edwards
New Bloomfield	Carson Long Institute	Edward L. Holman
Overbrook	The Episcopal Academy	Greville G. Haslam
Overbrook	Friends Central School	Barclay L. Jones
Pennsburg	Perkiomen School	Clarence E. Tobias, Jr.
Philadelphia	Brown Preparatory School	George J. Brown
Philadelphia	Carson College for Orphan Girls	Elsa Ueland
Philadelphia	Chestnut Hill Academy	Frederic E. Camp
Philadelphia	Convent of the Sacred Heart	Mother M. Helen Lucas
Philadelphia	Friends Select School	Walter W. Haviland
Philadelphia	Germantown Academy	Samuel E. Osbourn
Philadelphia	Germantown Friends School	Stanley R. Yarnall
Philadelphia	The Lankenau School	E. F. Bachmann
Philadelphia	Mount St. Joseph Academy	Sister Maria Kostka, Dean
Philadelphia	Oak Lane Country Day School	George H. Ivins
Philadelphia	The William Penn Charter School	Richard Knowles
Philadelphia	Springside School	Mrs. Samuel H. Paul
Philadelphia	Stevens School	Helen L. Church
Philadelphia	Temple University High School	Charles E. Metzger
Pittsburgh	Arnold School	Roger B. Merriman, Jr.
Pittsburgh	The Ellis School	Sara Frazer Ellis
Pittsburgh	Shady Side Academy	Demass Barnes, Acting
Pittsburgh	The University School	Guy H. Baskerville
Pittsburgh	The Winchester-Thurston School	Mary A. G. Mitchell
Pottstown	The Hill School	James I. Wendell
Rydal	Ogontz School	Abby A. Sutherland
Saltsburg	Kiskiminetas Springs School	W. H. MacColl
Swarthmore	The Mary Lyon School	Haldy M. Crist
Torresdale	Eden Hall	Mother H. Moclair
Washington	Washington Seminary	Jane C. Maxfield
Wayne	Valley Forge Military Academy	Milton G. Baker
Westtown	Westtown School	James F. Walker
Williamsport	Williamsport Dickinson Seminary	John W. Long
Wynnewood	The Agnes Irwin School	Bertha M. Laws
Wynnewood	Montgomery School	Gibson Bell
York	York Collegiate Institute	Lester F. Johnson
Rhode Island		
East Greenwich	East Greenwich Academy	Ira W. LeBaron
Newport	St. George's School	J. Vaughan Merrick
Portsmouth	Portsmouth Priory School	J. Hugh Diman
Providence	Lincoln School	Frances E. Wheeler
Providence	The Moses Brown School	L. Ralston Thomas
Providence	The Mary C. Wheeler School	Mary Helena Dey
South Carolina		
Aiken	Fermata School	E. B. Turnbach
Bamberg	Carlisle School	James F. Risher
Charleston	Ashley Hall	Mary V. McBee
Greenwood	Bailey Military Academy	James D. Fulp
Tennessee		
Baxter	Baxter Seminary	Harry L. Upperman
Bell Buckle	Webb School	W. R. Webb
Butler	Watauga Academy	Paul Kates
Chattanooga	Baylor School	Herbert B. Barks
Chattanooga	Girls' Preparatory School	Tommie P. Duffy
Chattanooga	The McCallie School	S. J. McCallie
Collegedale	Southern Junior College	J. C. Thompson
Columbia	Columbia Military Academy	L. U. Ragsdale, Supt.
Franklin	Battle Ground Academy	George I. Briggs
Lebanon	Castle Heights Military Academy	Harry L. Armstrong
Memphis	Miss Hutchison's School	Mary G. Hutchison
Nashville	Peabody Demonstration School	W. H. Yarbrough
Petersburg	Morgan School	R. Kenneth Morgan, Jr.
Pleasant Hill	Pleasant Hill Academy	Oscar M. Fogle
Sewanee	Sewanee Military Academy	William R. Smith
Sweetwater	Tennessee Military Institute	C. R. Endsley
Texas		
Bryan	Allen Academy	N. B. Allen
Dallas	Hockaday School for Girls	Ela Hockaday
Dallas	Terrill Preparatory School & Junior College	S. M. Davis
El Paso	Radford School for Girls	L. deL. Templin
Houston	Kinkaid School	Mrs. M. J. Kinkaid
Houston	St. Thomas College High School	A. L. Higgins
Laredo	Holding Institute	Anton Deschner, Supt.
San Antonio	Peacock Military Academy	Wesley Peacock, Jr.
San Antonio	St. Mary's Hall	Ruth Coit
San Antonio	Texas Military Institute	W. W. Bondurant
San Marcos	San Marcos Academy	R. M. Cavness
Utah		
Salt Lake City	Rowland Hall	Wilfrida Messenger
Vermont		
Lyndon Center	Lyndon Institute	O. D. Mathewson
Manchester	Burr & Burton Seminary	Ralph E. Howes
Montpelier	Montpelier Seminary	Arthur W. Hewitt
Putney	Putney School	Mrs. Sebastian Hinton
St. Johnsbury	St. Johnsbury Academy	Stanley R. Oldham
Saxtons River	Vermont Academy	Lawrence G. Leavitt
Virginia		
Alexandria	Episcopal High School	A. R. Hoxton
Alexandria	St. Agnes School	Mrs. G. C. Macan
Chatham	Chatham Hall	Edmund J. Lee
Chatham	Hargrave Military Academy	Aubrey H. Camden
Danville	Virginia Presbyterian School	William M. Kemper
Ferrum	Ferrum Training School	J. A. Chapman
Fork Union	Fork Union Military Academy	J. J. Wicker
Fort Defiance	Augusta Military Academy	Thos. J. Roller

City	Institution	Head
Front Royal	Randolph-Macon Academy	John C. Boggs
Greenway	The Madeira School	Mrs. David Wing
Grundy	Grundy Presbyterian School	Frank B. Clark
Lynchburg	Virginia Episcopal School	Oscar deW. Randolph
Middleburg	Foxcroft School	Charlotte H. Noland
Richmond	The Collegiate School for Girls	Mrs. Wm. T. Hodges
Richmond	McGuire's University School	John P. McGuire
Staunton	Staunton Military Academy	Emory J. Middour
Staunton	Stuart Hall	Ophelia S. T. Carr
Warrenton	Warrenton Country School	Lea M. Bouligny
Waynesboro	Fairfax Hall Junior College	W. B. Gates
Waynesboro	Fishburne Military School	M. H. Hudgins
Richmond	St. Catherine's School	Louisa de B. B. Brackett
Richmond	St. Christopher's School	C. G. Chamberlayne
Woodberry Forest	Woodberry Forest School	J. Carter Walker
Woodstock	Massanutten Academy	H. J. Benchoff

Washington

Seattle	Helen Bush School	Helen T. Bush
Seattle	Saint Nicholas School	Fanny C. Steele
Tacoma	Annie Wright Seminary	Sallie E. Wilson

West Virginia

Lewisburg	Greenbrier Military School	H. B. Moore

Wisconsin

Delafield	St. John's Military Academy	Roy F. Farrand
Kenosha	Kemper Hall	Sister Mary Ambrose
Lake Geneva	Northwestern Military & Naval Academy	R. P. Davidson
Milwaukee	Milwaukee Country Day School	A. Gledden Santer
Milwaukee	Milwaukee-Downer Seminary	Helen K. Burtt
Milwaukee	Milwaukee University School	Frank S. Spigener
Prairie du Chien	Campion Jesuit High School	J. C. Friedl

Canada

Montreal, Que.	Lower Canada College	V. C. Wansbrough
Montreal, Que.	Loyola High School	Hugh C. McCarthy
Montreal, Que.	Mt. St. Louis College	Brother Robert
Quebec, Que.	Ursuline College	Soeur Ste. Clotilde
Sackville, N. B.	Mt. Allison Academy and Commercial College	W. T. R. Flemington
Toronto, Ont.	Bishop Strachan School	Miss E. M. Lowe
Toronto, Ont.	Branksome Hall	Edith M. Read
Toronto, Ont.	Havergal College	Miss G. E. Millard
Toronto, Ont.	St. Joseph's College School	Sister Maura
Winnipeg, Man.	St. John's College School	W. Burman
Wolfville, N. S.	Horton Academy	E. W. Robinson

Cuba

Habana	Cathedral School	Mary C. Nichols

Hawaii

Honolulu	Kamehameha Boys School	Homer F. Barnes

Philippine Islands

Baguio	Brent School	A. H. Richardson

SECTION XVI

SUPERINTENDENTS OF SCHOOLS IN PLACES OF 5000 POPULATION AND OVER

In the following list are included all places which are known to have a superintendent of schools and which, according to the 1930 Federal Census, have a population of 5,000 or over. These include incorporated cities, towns, boroughs and villages, unincorporated towns (in New England), and townships classified as urban by the Bureau of the Census. The names of the superintendents have been revised to December, 1937, and in some cases more recently.

References

(a) County superintendent. (b) Parish superintendent.

City	*Superintendent*
Alabama	
Andalusia	C. L. Martin
Anniston	C. C. Moseley
Bessemer	J. Clyde Orr
Birmingham	C. B. Glenn
Decatur	W. W. Benson
Dothan	Bruce Flurry
Eufaula	T. G. Wilkinson
Fairfield	B. B. Baker
Florence	J. W. Powell
Gadsden	C. A. Donehoo
Huntsville	W. G. Hamm
Jasper	G. T. Patrick
Lanett	Taylor H. Kirby
Mobile	W. C. Griggs
Montgomery	C. M. Dannelly
Opelika	R. B. Mardre
Phenix City	L. P. Stough
Selma	Walter M. Jackson
Sheffield	L. E. Creel
Talladega	Frank L. Harwell
Tarrant	W. A. Parker
Troy	L. D. Bynum
Tuscaloosa	H. G. Dowling
Arizona	
Bisbee	R. E. Souers
Douglas	J. E. Carlson, Jr.
Globe	H. E. Stevenson
Miami	Ivan P. Hostetter
Morenci	W. E. Lutz
Nogales	A. J. Mitchell
Phoenix	John D. Loper
Prescott	Donald Sheldon
Tucson	C. E. Rose
Arkansas	
Blytheville	W. D. McClurkin
Camden	F. W. Whiteside
Conway	B. A. Short
El Dorado	J. I. McClurkin
Fayetteville	Frank S. Root
Fort Smith	J. W. Ramsey
Helena	J. F. Wahl
Hope	Miss Beryl Henry
Hot Springs National Park	Harvey H. Haley
Jonesboro	R. H. Moore
Little Rock	R. C. Hall
Malvern	J. L. Pratt
No. Little Rock	T. H. Alford
Paragould	Rufus D. Haynes
Pine Bluff	J. R. Allen
Russellville	E. W. Bass
Texarkana	P. N. Bragg
Van Buren	D. M. Riggin
California	
Alameda	Wm. G. Paden
Albany	Allen Keim
Alhambra	Geo. E. Bettinger
Anaheim	M. A. Gauer (Elementary) J. A. Clayes (High)
Arcadia	Elmer E. Westerhouse
Bakersfield	L. E. Chenoweth
Berkeley	Virgil E. Dickson
Beverly Hills	E. J. Hummel
Brawley	Geo. K. Anderson
Burbank	B. F. Enyeart
Burlingame	L. D. Henderson
Calexico	J. W. Lawson
Chico	F. L. Cummings
Colton	J. H. Waldron
Compton	Ardella B. Tibbey (Elementary) O. S. Thompson (High)
Corona	Frank E. Bishop
Coronado	F. A. Boyer (Elementary) J. Leslie Cutler (High)
Culver City	Mrs. Helen D. Hayward
Daly City	R. L. Crane
El Centro	Guy A. Weakley
Eureka	G. B. Albee
Fresno	Homer C. Wilson
Fullerton	R. E. Green (Elementary) Louis E. Plummer (High)
Glendale	Norman R. Whytock
Hanford	C. E. Denham
Hawthorne	Herman A. Buckner
Hayward	Robert M. Reid
Inglewood	George M. Green (High) Robert E. Cralle (Elementary)
Lodi	LeRoy Nichols
Long Beach	K. E. Overholtzer
Los Angeles	Vierling Kersey
Martinez	Forrest V. Routt
Marysville	W. A. Kynoch
Merced	W. M. Smith (Elementary) A. W. Meany (High)
Modesto	J. H. Bradley
Monrovia	J. Warren Ayer
Montebello	Mark R. Jacobs
Monterey	J. R. Croad (Elementary) J. R. McKillop (High)
Napa	Irene Snow (Elementary) F. E. Crawford (High)
National City	Fred M. Tonge (Elementary) J. M. McDonald (High)
Oakland	E. W. Jacobsen
Ontario	C. W. Randall
Orange	Carl Thomas
Oxnard	R. B. Haydock
Pacific Grove	R. H. Down
Palo Alto	J. R. Overturf
Pasadena	J. A. Sexson
Petaluma	David M. Durst
Piedmont	Harry W. Jones
Pittsburg	F. S. Ramsdell
Pomona	Emmett Clark
Porterville	Emmett R. Berry
Redlands	John Branigan
Redondo Beach	Harry P. McCandless (Elementary) Aileen S. Hammond (High)
Redwood City	Andrew Spinas
Richmond	W. T. Helms
Riverside	Ira C. Landis
Roseville	W. T. Eich
Sacramento	C. C. Hughes
Salinas	R. D. Case
San Bernardino	Albert D. Graves
San Diego	Will C. Crawford
San Francisco	J. P. Nourse
San Gabriel	R. B. Walter
San Jose	W. L. Bachrodt
San Leandro	Andrew J. Cartwright
San Luis Obispo	Charles E. Teach
San Mateo	George W. Hall (Elementary) Homer Martin (High)
San Rafael	O. R. Hartzell
Santa Ana	Frank A. Henderson
Santa Barbara	Curtis E. Warren
Santa Clara	S. J. Brainerd
Santa Cruz	Roy E. Simpson
Santa Maria	Robert Bruce (Elementary) Andrew P. Hill, Jr. (High)
Santa Monica	Percy R. Davis
Santa Paula	George A. Bond ((Elementary) F. M. Eakin (High)
Santa Rosa	Jerome O. Cross
South Pasadena	George C. Bush
South San Francisco	A. C. Kleemeyer
Stockton	Ansel S. Williams
Taft	James A. Joyce
Tulare	W. B. Knokey
Vallejo	Elmer L. Cave
Ventura	James M. Sexton
Visalia	DeWitt Montgomery
Watsonville	T. S. MacQuiddy
Whittier	Will Wiley (Elementary) D. A. Stouffer (High)
Woodland	T. L. Whitehead
Colorado	
Alamosa	G. P. Young
Boulder	Virgil M. Rogers
Canon City	L. L. Beahm
Colorado Springs	H. M. Corning
Denver	A. J. Stoddard
Durango	Emory E. Smiley
Englewood	R. D. Jenkins
Fort Collins	Ward I. Miller
Grand Junction	J. Fred Essig
Greeley	Hubert D. Eldridge
La Junta	G. T. Wilson
Longmont	Kent L. Sanborn
Loveland	R. W. Truscott
Pueblo	District No. 1, J. H. Risley District No. 20, Ray E. Redmond
Salida	L. D. Hightower
Sterling	R. R. Knowles
Trinidad	William R. Ross
Walsenburg	S. M. Andrews
Connecticut	
Ansonia	John J. Stevens
Bridgeport	Worcester Warren

City	Superintendent
Bristol	Karl A. Reiche
Danbury	Harold F. Dow
Darien	Edward H. Fuller
Derby	Richard T. Tobin
E. Hartford	P. S. Barnes
E. Haven	W. E. Gillis
Enfield	E. H. Parkman
Fairfield	A. M. McCullough
Glastonbury	Francis S. Knox
Greenwich	Edwin C. Andrews
Griswold	Ernest Lake
Groton	S. B. Butler
Hamden	Margaret L. Keefe
Hartford	Fred D. Wish, Jr.
Killingly	W. E. Parker
Manchester	Arthur H. Illing
Meriden	Nicholas Moseley
Middletown	Fred W. Shearer
Middletown (twp.)	Van Buren Moody
Milford	C. W. Maddocks
Naugatuck	H. E. Chittenden
New Britain	C. C. Ring
New Haven	J. A. Fitzgerald
New London	Warren A. Hanson
Norwalk	Philip A. Jakob
Norwich	E. J. Graham
Plainfield	J. L. Chapman
Plainville	Harold W. Thomas
Plymouth	H. S. Fisher
Putnam	Carl M. Diefenbach
Rockville	Philip M. Howe
Seymour	H. L. Adams
Shelton	Harry E. Fowler
Southington	William Strong
Stafford	Earl M. Witt
Stamford	Leon C. Staples
Stonington	R. D. Tucker
Stratford	E. Ward Ireland
Torrington	G. J. Vogel
Vernon	P. M. Howe
Wallingford	H. M. Jeffords
Waterbury	Thomas J. Condon
Watertown	G. C. Swift
West Hartford	Lloyd H. Bugbee
West Haven	Seth G. Haley
Westport	Heath E. White
Wethersfield	Wilson Greer
Windham	Egbert A. Case
Windsor	Earle S. Russell
Winsted	L. R. McKusick

Delaware

Wilmington	S. M. Stouffer

District of Columbia

Washington	Frank W. Ballou

Florida

Bartow	C. I. Hollingsworth (a)
Bradenton	Jessie P. Miller (a)
Clearwater	G. V. Fuguitt (a)
Coral Gables (Address Miami)	J. T. Wilson (a)
Daytona Beach (Address Deland)	G. W. Marks (a)
Deland	G. W. Marks (a)
Fort Lauderdale	Ulric J. Bennett (a)
Fort Myers	Harry F. Hendry (a)
Gainesville	Horace F. Zetrouer (a)
Jacksonville	R. C. Marshall (a)
Key West	M. E. Russell (a)
Lakeland (Address Bartow)	C. I. Hollingsworth (a)
Lake Worth (Address W. Palm Beach)	John I. Leonard (a)
Miami	J. T. Wilson (a)
Miami Beach (Address Miami)	J. T. Wilson (a)
Ocala	Don T. Mann (a)
Orlando	Judson B. Walker (a)
Palatka	L. S. Barstow (a)
Panama City	A. L. Hardy (a)
Pensacola	J. H. Varnum (a)
Plant City (Address Tampa)	E. L. Robinson (a)
River Junction (Address Quincy)	C. H. Gray (a)
St. Augustine	D. D. Corbett (a)
St. Petersburg (Address Clearwater)	G. V. Fuguitt (a)
Sanford	T. W. Lawton (a)
Sarasota	T. W. Yarbrough (a)
Tallahassee	F. A. Rhodes (a)
Tampa	E. L. Robinson (a)
West Palm Beach	John I. Leonard (a)
Winter Haven (Address Bartow)	C. I. Hollingsworth (a)

Georgia

Albany	J. O. Allen
Americus	J. E. Mathis
Athens	B. M. Grier
Atlanta	W. A. Sutton
Augusta	S. D. Copeland
Bainbridge	E. G. Elcan
Brunswick	G. W. Wannamaker
Carrollton	M. C. Wiley
Cartersville	W. H. Brandon
Cedartown	J. E. Purks
Columbus	Paul Munro
Cordele	D. H. Standard
Dalton	W. W. Stancil
Decatur	Lamar Ferguson
Dublin	A. J. Hargrove
East Point	Paul West
Fitzgerald	Fred Ayres
Gainesville	C. J. Cheves
Griffin	J. L. Fortney
Lagrange	F. F. Rowe
Macon	W. P. Jones
Marietta	C. A. Keith
Milledgeville	J. H. Jenkins
Moultrie	J. L. Yaden
Newnan	C. B. Mathews
Rome	B. F. Quigg
Savannah	O. B. Strong
Thomasville	B. B. Broughton
Valdosta	A. G. Cleveland
Waycross	Ralph Newton

Idaho

Boise	W. D. Vincent
Coeur d'Alene	G. O. Phippeny
Idaho Falls	W. W. Christensen
Lewiston	Glenn W. Todd
Nampa	J. E. Walsh
Pocatello	E. Norman Vaughn
Twin Falls	Homer Davis

Illinois

Alton	W. R. Curtis
Argo-Summit	Clarence Barrett
Aurora	K. D. Waldo (East Side) C. E. Larson (West Side)
Batavia	H. C. Storm
Beardstown	W. L. Gard
Belleville	H. V. Calhoun
Belvidere	R. E. Garrett
Benton	Charles M. Johnson
Berwyn	William Hawkes (Dist. No. 98) E. W. Martin (Dist. No. 100)
Bloomington	James A. Lindsay
Blue Island	H. A. Perrin
Brookfield	E. N. Cassady
Cairo	Leo C. Schultz
Calumet City	Eric E. Brown
Canton	Ben Kietzman
Carbondale	Raymond Hoffner
Centralia	R. V. Jordon
Champaign	V. L. Nickell
Charleston	U. B. Jeffries
Chicago	Wm. H. Johnson
Chicago Heights	Ben A. Sylla
Cicero	G. A. Schwebel
Clinton	F. D. Merriman
Collinsville	E. B. Burroughs
Danville	C. E. Vance
Decatur	William Harris
De Kalb	F. W. Phillips
Des Plaines	E. R. Selleck
Dixon	A. H. Lancaster
Downers Grove	George De Wolf
Dundee	H. D. Jacobs
Duquoin	Joe Strickler
East Moline	D. B. Hoffman
East Peoria	Paul L. Bolin
East St. Louis	D. Walter Potts
Edwardsville	E. L. Alexander
Elgin	Theodore Saam
Elmhurst	V. L. Beggs
Elmwood Park	George N. Wells
Evanston	J. R. Skiles (Dist. No. 75) David E. Walker (Dist. No. 76)
Forest Park	W. S. Dimmett
Freeport	B. F. Shafer
Galesburg	O. O. Young
Gillespie	J. W. White
Glencoe	Paul J. Misner
Glen Ellyn	S. A. Denison
Granite City	A. M. Wilson
Harrisburg	W. Russell Malan
Harvey	C. C. Thompson
Herrin	John R. Creek
Highland Park	R. H. Price (Dist. No. 107) Clark G. Wright (Dist. No. 108)
Hinsdale	Martin B. Travis
Hoopeston	W. R. Lowery
Jacksonville	R. O. Stoops
Johnston City	Earl E. Miller
Joliet	G. N. Hufford
Kankakee	Irving Munson
Kewanee	Charles A. Bruner
La Grange	J. C. Davies
Lake Forest	Melvin G. Davis
La Salle	J. B. McManus
Lawrenceville	M. N. Todd
Lincoln	D. F. Nichols
Litchfield	Oscar M. Chute
Lombard	Mrs. Ada Manning
Macomb	C. S. Chappelear
Madison	E. W. Heob
Marion	H. O. Belford
Mattoon	H. B. Black
Maywood	Eugene La Rowe
Melrose Park	Eugene La Rowe
Metropolis	C. J. Ramsay
Moline	E. P. Nutting
Monmouth	LeRoy Fetherston
Morris	B. R. Bowden
Mount Carmel	R. S. Condrey
Mount Vernon	J. Lester Buford
Murphysboro	Wm. H. Carruthers
Naperville	R. E. Beebe
Niles Center	R. E. Cotanche
Normal	Monroe Melton
North Chicago	F. E. De Yoe (Dist. No. 63) R. L. Newenham (Dist. No. 64)
Oak Park	W. J. Hamilton
Olney	C. T. Cramer
Ottawa	C. J. Byrne
Pana	Hamilton Hale
Paris	John R. Moss
Park Ridge	Harry D. Winslow
Pekin	C. B. Smith
Peoria	E. C. Fisher
Peru	C. W. Martin
Pontiac	A. F. Speltz
Quincy	W. H. Lemmel
River Forest	Ray E. Cheney
Riverside	L. J. Hauser
Rockford	Selmer H. Berg
Rock Island	Earl H. Hanson
St. Charles	G. E. Thompson
Savanna	W. D. Waldrip
Springfield	R. E. Fildes
Spring Valley	James Nesti
Sterling	O. A. Fackler (Dist. No. 11) H. U. Challand (Dist. No. 10)
Streator	H. K. Whittier
Taylorville	G. W. Wilcockson
Urbana	T. H. Cobb
Venice	J. H. Gore
Villa Park	H. E. Hinkel
Waukegan	John S. Clark
West Frankfort	C. A. Waller
Wheaton	K. K. Tibbetts
Wilmette	J. R. Harper
Winnetka	C. W. Washburne

City	Superintendent
Wood River	G. A. Smith
Woodstock	W. J. Calahan
Zion	Edgar T. Stephens
Indiana	
Anderson	Arthur Campbell
Auburn	H. L. McKenney
Bedford	Warren J. Yount
Bicknell	Harold Axe
Bloomington	H. E. Binford
Bluffton	L. R. Willey
Brazil	C. P. Keller
Clinton	E. C. Boyd
Columbus	Donald Du Shane
Connersville	E. C. Dodson
Crawfordsville	M. C. Darnall
Decatur	Walter J. Krick
East Chicago	Roy Feik
Elkhart	J. F. Wiley
Elwood	William F. Smith
Evansville	Ralph Irons
Fort Wayne	Merle Abbett (c)
Frankfort	M. N. O'Bannon
Franklin	R. W. Sheek
Gary	William A. Wirt
Goshen	Ort L. Walter
Greensburg	Carl Billings
Hammond	L. L. Caldwell
Hartford City	Joseph C. Wagner
Hobart	J. M. Sellers
Huntington	C. E. Byers
Indianapolis	DeWitt S. Morgan
Jeffersonville	E. G. McCullum
Kendallville	H. M. Dixon
Kokomo	C. V. Haworth
Lafayette	Morris McCarty
La Porte	E. B. Wetherow
Lebanon	Paul Van Riper
Linton	T. J. Beecher
Logansport	W. L. Sprouse
Madison	E. O. Muncie
Marion	Elbert E. Day
Michigan City	Milo C. Murray
Mishawaka	P. C. Emmons
Mount Vernon	J. G. Turner
Muncie	H. B. Allman
New Albany	C. B. McLinn
New Castle	E. J. Llewelyn
Peru	J. P. Crodian
Plymouth	Ray Kuhn
Portland	J. C. Webb
Princeton	G. E. Derbyshire
Richmond	W. G. Bate
Rushville	L. A. Lockwood
Seymour	N. J. Lasher
Shelbyville	W. F. Loper
South Bend	Frank E. Allen
Sullivan	Dale C. Billman
Terre Haute	George C. Carroll
Valparaiso	Roy B. Julian
Vincennes	V. L. Eikenberry
Wabash	O. J. Neighbours
Warsaw	James M. Leffel
Washington	Clyde Parker
West Lafayette	F. A. Burtsfield
Whiting	W. W. Borden
Iowa	
Ames	Jordan L. Larson
Atlantic	J. P. Street
Boone	H. J. Van Ness
Burlington	R. H. Bracewell
Cedar Falls	J. H. Peet
Cedar Rapids	Arthur Deamer
Centerville	E. W. Fannon
Chariton	J. R. Cougill
Charles City	P. C. Lapham
Cherokee	J. C. Hoglan
Clinton	M. M. Schell
Council Bluffs	J. A. True
Creston	Burton R. Jones
Davenport	Irvin H. Schmitt
Des Moines	A. W. Merrill
Dubuque	E. D. Cline
Fairfield	W. G. Pence
Fort Dodge	K. D. Miller
Fort Madison	A. I. Tiss
Iowa City	I. A. Opstad
Keokuk	R. L. Reid
Marshalltown	W. F. Shirley
Mason City	R. B. Irons
Muscatine	A. A. Johnson
Newton	B. C. Berg
Oelwein	G. B. Ferrell
Oskaloosa	R. J. Carroll
Ottumwa	Frank W. Douma
Perry	J. S. Vanderlinden
Red Oak	J. R. Inman
Shenandoah	W. Dean McKee
Sioux City	L. W. Feik
Spencer	H. J. Williams
Waterloo	J. M. Logan (East Side) Charles A. Kittrell (West Side)
Webster City	Burrus E. Beard
Kansas	
Abilene	F. C. Gardner
Arkansas City	C. E. St. John
Atchison	W. D. Wolfe
Chanute	L. H. Petit
Coffeyville	K. W. McFarland
Concordia	E. B. Allbaugh
Dodge City	A. G. Schroedermeier
Eldorado	J. F. Hughes
Emporia	W. M. Richards
Fort Scott	V. M. Liston
Garden City	Ira O. Scott
Great Bend	H. C. Scarborough
Hutchinson	J. W. Gowans
Independence	J. H. Clement
Iola	John Fleming
Junction City	W. A. Wood
Kansas City	F. L. Schlagle
Lawrence	C. E. Birch
Leavenworth	I. J. Bright
Liberal	N. B. Mahuron
Manhattan	W. E. Sheffer
McPherson	R. W. Potwin
Newton	J. B. Heffelfinger
Ottawa	G. H. Marshall
Parsons	R. H. Hughes
Pittsburg	M. M. Rose
Pratt	Amos W. Glad
Salina	W. S. Heusner
Topeka	A. J. Stout
Wellington	Claude Kissick
Wichita	L. W. Mayberry
Winfield	Evan E. Evans
Kentucky	
Ashland	W. L. Brooker
Bellevue	W. H. Marshall, Acting
Bowling Green	L. C. Curry
Catlettsburg	J. T. Miracle
Corbin	G. W. Campbell
Covington	G. O. Swing
Danville	E. F. Birckhead
Dayton	Olin W. Davis
Fort Thomas	D. W. Bridges
Frankfort	J. W. Ireland
Glasgow	J. W. Depp
Hazard	R. T. Whittinghill
Henderson	C. E. Dudley
Hopkinsville	Gladstone Koffman
Jenkins	C. V. Snapp
Lexington	Henry H. Hill
Louisville	Zenos E. Scott
Ludlow	J. S. Brown
Madisonville	Harper Gatton
Mayfield	K. R. Patterson
Maysville	John Shaw
Middlesboro	J. W. Bradner
Newport	A. D. Owens
Owensboro	J. L. Foust
Paducah	H. L. Smith
Paris	Lee Kirkpatrick
Richmond	W. F. O'Donnell
Somerset	P. H. Hopkins
Winchester	B. B. Hodgkin
Louisiana	
Alexandria	H. M. Wells (b)
Bastrop	E. D. Shaw (b)
Baton Rouge	C. B. Turner (b)
Bogalusa	J. N. Herrington
Crowley	A. T. Browne (b)
Gretna	J. C. Ellis (b)
Hammond	C. C. Pittman (b)
Houma	H. L. Bourgeois (b)
Lafayette	J. W. Faulk (b)
Lake Charles	Ward Anderson
Minden	J. E. Pitcher
Monroe	E. L. Neville
Morgan City	R. L. Robinson (b)
New Iberia	L. G. Porter (b)
New Orleans	Nicholas Bauer (b)
Opelousas	W. B. Prescott
Plaquemine	L. P. Terrebonne (b)
Shreveport	E. W. Jones (b)
West Monroe	T. O. Brown (b)
Maine	
Auburn	G. R. Gardner
Augusta	F. W. Burrill
Bangor	I. W. Small
Bath	John Parker
Belfast	Horatio S. Reed
Biddeford	A. A. Garcelon
Brewer	H. R. Houston
Brunswick	Leon P. Spinney
Calais	Alden Allen
Caribou	G. M. Carter
Fairfield	W. H. Phinney
Gardiner	A. R. Carter
Houlton	Philip H. Woodworth
Lewiston	C. W. Bickford
Millinocket	W. M. Marr
Oldtown	W. O. Chase
Portland	W. B. Jack
Presque Isle	R. J. Carpenter
Rockland	George J. Cumming
Rumford	L. E. Williams
Saco	Harry C. Hull
Sanford	J. A. Hamlin
Skowhegan	W. B. Woodbury
South Portland	L. C. Day
Waterville	C. E. Glover
Westbrook	Guy Sinclair
Maryland	
Annapolis	George Fox (a)
Baltimore	D. E. Weglein
Cambridge	J. B. Noble (a)
Cumberland	C. L. Kopp (a)
Frederick	E. W. Pruitt (a)
Frostburg (Address Cumberland)	C. L. Kopp (a)
Hagerstown	B. J. Grimes (a)
Salisbury	J. M. Bennett (a)
Tacoma Park (Address Rockville)	Edwin W. Broome (a)
Massachusetts	
Abington	C. A. Record
Adams	J. F. Farrell
Agawam	B. J. Phelps
Amesbury	Fred C. English
Amherst	L. L. Dudley
Andover	H. C. Sanborn
Arlington	Joseph S. Keating
Athol	William A. Spooner
Attleboro	L. A. Fales
Auburn	C. M. Harris
Barnstable	R. R. Barr
Belmont	F. A. Scott
Beverly	Starr M. King
Billerica	E. C. Vining
Boston	Arthur L. Gould
Braintree	C. E. Fisher
Bridgewater	John C. Davis
Brockton	John L. Miller
Brookline	E. R. Caverly
Cambridge	M. E. Fitzgerald
Canton	Richard N. Anketell
Chelmsford	G. S. Wright
Chelsea	G. C. Francis
Chicopee	J. J. Desmond, Jr.
Clinton	T. F. Gibbons
Concord	W. A. Hall
Danvers	I. G. Smith
Dartmouth	A. R. Paull
Dedham	J. C. Anthony
Dracut	James C. Riley
Easthampton	H. D. Casey
Easton	G. C. Mann

City	Superintendent
Everett	F. A. Ashley
Fairhaven	C. F. Prior
Fall River	H. L. Belisle
Falmouth	Paul Dillingham
Fitchburg	Jerome Burtt
Foxborough	Chase McArthur
Framingham	Burr J. Merriam
Franklin	A. W. Hale
Gardner	F. T. Reynolds
Gloucester	E. W. Fellows
Grafton	A. S. Cole
Great Barrington	R. H. Bellows
Greenfield	F. W. Porter
Haverhill	A. I. Clow
Hingham	O. K. Collins
Holyoke	W. R. Peck
Hudson	E. J. Harriman
Ipswich	Nathaniel N. Love
Lawrence	Dennis E. Callahan
Leominster	Wm. B. Appleton
Lexington	T. S. Grindle
Lowell	V. M. McCartin
Ludlow	P. R. Baird
Lynn	H. S. Gruver
Malden	F. G. Marshall
Mansfield	Bert L. Merrill
Marblehead	James W. Vose
Marlboro	E. P. Carr
Maynard	J. P. King
Medford	J. S. Kadesch
Melrose	H. H. Stuart
Methuen	L. H. Conant
Middleboro	J. S. Cushing
Milford	A. O. Caswell
Millbury	William D. Shea
Milton	H. F. Turner
Montague	Arthur E. Burke
Natick	C. R. Hall
Needham	Harry A. Brown
New Bedford	A. P. Keith
Newburyport	C. R. Thibadeau
Newton	Julius Warren
North Adams	John F. McGrory
Northampton	William R. Barry
North Andover	F. E. Pitkin
North Attleboro	G. W. Morris
Northbridge	H. J. Phipps
Norwood	Lincoln D. Lynch
Orange	E. C. Hempel
Palmer	C. H. Hobson
Peabody	Wm. A. Welch
Pittsfield	Edward J. Russell
Plymouth	A. B. Handy
Quincy	J. N. Muir
Randolph	A. O. Christiansen
Reading	Arthur E. Pierce
Revere	C. F. Lindstol
Rockland	R. S. Esten
Salem	G. M. Bemis
Saugus	Vernon W. Evans
Shrewsbury	M. A. Sturtevant
Somerset	H. F. Bates
Somerville	E. W. Ireland
Southbridge	Channing H. Greene
South Hadley	Albert T. Patty
Spencer	I. H. Agard
Springfield	John E. Granrud
Stoneham	C. E. Varney
Stoughton	Warren B. Lyman
Swampscott	Frank L. Mansur
Taunton	W. A. Mowry
Tewksbury	S. G. Bean
Uxbridge	A. B. Garcelon
Wakefield	W. B. Atwell
Walpole	A. C. Jones
Waltham	W. H. Slayton
Ware	M. LeRoy Greenfield
Wareham	Bion C. Merry
Watertown	W. H. Price
Webster	J. A. Lobban
Wellesley	Edwin H. Miner
Westboro	J. H. Armstrong
Westfield	C. D. Stiles
West Springfield	J. R. Fausey
Weymouth	P. T. Pearson
Whitman	F. E. Holt
Winchendon	C. A. Mitchell
Winchester	J. J. Quinn
Winthrop	E. R. Clarke
Woburn	Daniel P. Hurld
Worcester	W. S. Young

Michigan

City	Superintendent
Adrian	Ernest J. Reed
Albion	Don Harrington
Alma	F. R. Phillips
Alpena	Russel Wilson
Ann Arbor	O. W. Haisley
Battle Creek	Eldon C. Geyer
Bay City	Ben Klager
Benton Harbor	S. C. Mitchell
Berkeley	R. B. French
Birmingham	Howard Crull
Cadillac	B. C. Shankland
Charlotte	Jay Dykhouse
Coldwater	J. T. Symons
Dearborn	Ray H. Adams
Detroit	Frank Cody
Dowagiac	C. M. Horn
East Detroit	John Kantner
Ecorse	C. J. Miller
Escanaba	John A. Lemmer
Ferndale	E. F. Down
Flint	L. H. Lamb
Gladstone	A. R. Watson
Grand Haven	E. H. Babcock
Grand Rapids	A. W. Krause
Grosse Pointe	S. M. Brownell
Hamtramck	M. A. Kopka
Hancock	O. M. Vedder
Hastings	D. A. Van Buskirk
Highland Park	I. M. Allen
Hillsdale	B. L. Davis
Holland	E. E. Fell
Ionia	A. A. Rather
Iron Mountain	John Jelsch
Ironwood	Arthur E. Erickson
Ishpeming	C. L. Phelps
Jackson	Harold Steele
Kalamazoo	Loy Norrix
Kingsford	Frank C. Sweeney
Lansing	J. W. Sexton
Lapeer	E. E. Irwin
Lincoln Park	Leo W. Huff
Ludington	H. H. Hawley
Manistee	Dorr L. Wilde
Manistique	A. F. Hall
Marquette	W. M. Whitman
Marshall	H. W. Holmes
Menominee	J. L. Silvernale
Midland	J. J. Schafer
Monroe	George T. Cantrick
Mount Clemens	L. W. Fast
Mount Pleasant	G. E. Ganiard
Muskegon	John A. Craig
Muskegon Heights	W. R. Booker
Negaunee	H. S. Doolittle
Niles	F. W. Crawford
Owosso	E. J. Willman
Petoskey	H. C. Spitler
Pontiac	James H. Harris
Port Huron	L. A. Packard
River Rouge	A. McDonald
Roseville	Glenn Schoenhals
Royal Oak	N. J. Quickstad
Saginaw	C. F. Miller
St. Clair Shores	L. S. Lindsey, Frank Dixon and Bruce Calkins
St. Joseph	E. B. Holden
Sault Ste. Marie	G. G. Malcolm
Sturgis	Waldo Adams
Three Rivers	Walter Horst
Traverse City	Lars Hockstad
Wyandotte	F. W. Frostic
Ypsilanti	E. H. Chapelle

Minnesota

City	Superintendent
Albert Lea	H. R. Peterson
Austin	S. T. Neveln
Bemidji	J. W. Smith
Brainerd	W. C. Cobb
Chisholm	J. P. Vaughan
Cloquet	E. B. Anderson
Columbia Heights	H. C. Nelson
Crookston	L. M. Wikre
Duluth	H. H. Eelkema
Ely	Stanley Adkins
Eveleth	A. D. S. Gillett
Fairmont	John J. Skinner
Faribault	C. Willard Cross
Fergus Falls	L. H. Dominick
Hastings	Roy E. Miller
Hibbing	Sydney A. Patchin
International Falls	J. A. Sathrum
Little Falls	James K. Michie
Mankato	J. E. Anderson
Minneapolis	C. R. Reed
Moorhead	S. G. Reinertsen
New Ulm	Ernest M. Hanson
Owatonna	Irvin E. Rosa
Red Wing	R. J. Vieths
Rochester	G. H. Sanberg
St. Cloud	H. B. Gough
St. Paul	Paul S. Amidon
South St. Paul	Irvin T. Simley
Stillwater	Guy D. Smith
Virginia	L. A. Lavine
Willmar	A. M. Wisness
Winona	D. F. Dickerson

Mississippi

City	Superintendent
Biloxi	G. W. Ditto
Brookhaven	Edgar S. Bowlus
Clarksdale	H. B. Heidelberg
Columbus	C. N. Brandon
Corinth	Hal Anderson
Greenville	F. W. Murphy
Greenwood	W. C. Williams
Gulfport	B. Frank Brown
Hattiesburg	W. I. Thames
Jackson	K. P. Walker
Laurel	R. H. Watkins
McComb	D. L. Blackwelder
Meridian	H. M. Ivy
Natchez	W. H. Braden
Tupelo	T. M. Milam
Vicksburg	H. V. Cooper
Yazoo City	R. J. Koonce

Missouri

City	Superintendent
Boonville	L. E. Ziegler
Brookfield	L. V. Crookshank
Cape Girardeau	L. G. Schultz
Carthage	J. L. Campbell
Chillicothe	H. R. McCall
Clayton	John L. Bracken
Clinton	Arthur Lee
Columbia	W. E. Rosenstengel
De Soto	O. T. Coil
Flat River	Wesley A. Deneke
Fulton	Tom Conrad
Hannibal	E. T. Miller
Independence	E. B. Street
Jefferson City	R. T. Scobee
Joplin	E. A. Elliott
Kansas City	George Melcher
Kirksville	J. H. Neville
Kirkwood	F. P. Tillman
Maplewood	G. E. Dille
Marshall	Willard Graff
Maryville	H. S. Thomas
Mexico	L. H. Hawthorne
Moberly	M. F. Beach
Nevada	Jerry J. Vineyard
Poplar Bluff	G. F. Loughead
St. Charles	Stephen Blackhurst
St. Joseph	I. E. Stutsman
St. Louis	Henry J. Gerling
Sedalia	Heber U. Hunt
Sikeston	R. A. Harper
Springfield	Harry P. Study
Trenton	S. M. Rissler
University City	Charles Banks
Warrensburg	Edward Beatty
Washington	C. J. Burger
Webb City	D. R. McDonald
Webster Groves	W. E. Goslin
Wellston	Ernest F. Bush

Montana

City	Superintendent
Anaconda	W. K. Dwyer
Billings	M. C. Gallagher
Bozeman	D. S. Williams
Butte	Douglas Gold
Great Falls	Irving W. Smith
Havre	W. J. Shirley
Helena	Payne Templeton
Kalispell	W. D. Swetland
Lewistown	C. G. Manning
Livingston	B. A. Winans
Miles City	W. E. Stegner
Missoula	Ira B. Fee

City	Superintendent
Nebraska	
Alliance	H. G. Partridge
Beatrice	E. L. Novotny
Columbus	R. R. McGee
Fairbury	W. E. Scott
Falls City	A. B. Gelwick
Fremont	A. H. Waterhouse
Grand Island	C. Ray Gates
Hastings	A. H. Staley
Kearney	Harry A. Burke
Lincoln	M. C. Lefler
McCook	J. E. Shedd
Nebraska City	Marion R. Schrader
Norfolk	A. P. Burkhart
North Platte	W. J. Braham
Omaha	Homer W. Anderson
Scottsbluff	A. L. Burnham
York	Earle W. Wiltse
Nevada	
Las Vegas	Maude Frazier
Reno	E. Otis Vaughn
New Hampshire	
Berlin	Lloyd P. Young
Claremont	A. B. Kellogg
Concord	Chester A. Moody
Derry	George H. Whitcher
Dover	Chester L. Howe
Franklin	Fred S. Libbey
Keene	Laurence O. Thompson
Laconia	John S. Gilman
Lebanon	W. J. English
Manchester	L. P. Benezet
Nashua	Earle T. Tracey
Portsmouth	Harry L. Moore
Rochester	Arthur S. Rollins
Somersworth	H. L. Winslow
New Jersey	
Asbury Park	A. E. Kraybill
Atlantic City	Arthur Chenoweth
Audubon	William L. Fidler
Bayonne	Preston H. Smith
Belleville	W. R. Parmer
Bergenfield	Roy W. Brown
Bloomfield	Edgar S. Stover
Bogota	G. W. Leman
Boonton	M. Burr Mann
Bound Brook	Albert S. Davis
Bridgeton	Leigh M. Lott
Burlington	Vann H. Smith
Caldwell	D. C. Barnett
Camden	Leon N. Neulen
Carlstadt	Edward F. Krom
Carteret	Calvin F. Dengler
Cliffside Park	George F. Hall
Clifton	George J. Smith
Collingswood	John B. Ritter
Cranford	Howard R. Best
Dover	R. S. Bowlby
Dumont	Charles A. Selzer
Dunellen	Ralph W. Crane
East Orange	Henry E. Kentopp
East Rutherford	Alfred S. Faust
Elizabeth	Ira T. Chapman
Englewood	Winton J. White
Fairview	Z. G. Masten, Jr.
Fort Lee	J. B. Thompson
Freehold	Lloyd S. Cassel
Garfield	Norman W. Cameron
Glen Ridge	H. W. Dutch
Gloucester	Charles T. Hassard
Guttenburg	Anna L. Klein
Hackensack	George A. Merrill
Haddonfield	Everett C. Preston
Haddon Heights	William C. Davis
Hammonton	H. H. Smith
Harrison	John P. Murray
Hasbrouck Heights	C. C. Hitchcock
Hawthorne	F. H. Thoms
Highland Park	F. W. Furth
Hillside	A. G. Woodfield
Hoboken	Daniel S. Kealey
Irvington	Herschel S. Libby
Jersey City	James A. Nugent
Kearny	Edmund L. Tink
Lakewood	Carl M. Bair
Leonia	Nelson O. Smith
Linden	Paul R. Brown
Lodi	Henry V. Matthews
Long Branch	William M. Smith
Lyndhurst	H. P. Shepherd
Madison	Harry A. Wann
Manville	John Zorella
Metuchen	Carl H. Galloway
Millburn twp.	John R. Patterson
Millville	Wylie G. Pate
Montclair	A. L. Threlkeld
Morristown	J. Burton Wiley
Neptune twp.	O. J. Moulton
Newark	Stanley N. Rolfe
New Brunswick	F. J. Sickles
Newton	C. H. Reagle
North Arlington	W. R. Holbert
North Bergen	R. W. Madden
North Plainfield	Beekman R. Terhune
Nutley	John A. Spargo
Ocean City	George E. Brown
Orange	W. B. Patrick
Palisades Park	John W. Fuchs
Passaic	Arthur D. Arnold
Paterson	John R. Wilson
Paulsboro	Paul R. Carl
Pensauken twp.	George B. Fine
Perth Amboy	W. C. McGinniss
Phillipsburg	C. V. Sloan
Pitman	Daniel W. Davis
Plainfield	F. W. Cook
Pleasantville	Simon M. Horstick
Princeton	B. Woodhull Davis
Prospect Park (Address Paterson)	Edmund H. Viemeister
Rahway	Arthur Perry
Red Bank	Edwin C. Gilland
Ridgefield Park	A. Ray Palmer
Ridgewood	I. B. Somerville
Roselle	Joseph Bustard
Roselle Park	E. F. Smith
Rutherford	C. A. Fetterly
Salem	Halliday R. Jackson
Sayreville	Jesse Selner
Secaucus	M. J. Pechtel
Somerville	T. Latimer Brooks
South Amboy	Oscar O. Barr
South Orange	John H. Bosshart
South Plainfield	Harry C. Fries
South River	Lester A. Rodes
Summit	John B. Dougall
Teaneck	Lester N. Neulen
Tenafly	George A. Kipp
Trenton	Paul Loser
Union City	Albert C. Parker
Union twp.	Edward F. Waldron
Ventnor	H. R. Jackson
Verona	F. N. Brown
Vineland	Lawrence R. Winchell
Wallington	Joseph F. Moriarty
Weehawken	Kenneth F. Woodbury
Westfield	C. A. Philhower
West New York	H. L. Bain
West Orange	S. C. Strong
Wildwood	Henry C. Chalmers
Woodbury	H. L. Steins
Woodridge	H. Fremont Donley
New Mexico	
Albuquerque	John Milne
Clovis	J. M. Bickley
Gallup	Chas. L. Rose
Las Cruces	C. S. Conlee
Raton	E. E. Harrison
Roswell	J. D. Shinkle
Santa Fe	R. P. Sweeney
New York	
Albany	Austin R. Coulson
Amsterdam	Wilbur H. Lynch
Auburn	Charles G. Hetherington
Baldwin	Arthur E. Newton
Batavia	Clyde P. Wells
Beacon	E. D. Hewes
Binghamton	Daniel J. Kelly
Bronxville	Frederick H. Bair
Buffalo	Robt. T. Bapst
Canandaigua	Frank E. Fisk
Catskill	J. M. Schnitzer
Cohoes	William S. Schneider
Corning	William E. Severn (Dist. No. 9) Hugh W. Gregg (Dist. No. 13)
Cortland	E. G. Simmons
Depew	George R. Crego
Dobbs Ferry	J. A. McGinness
Dunkirk	F. R. Darling
East Rochester	Theodore L. R. Morgan
Elmira	H. O. Hutchinson
Elmira Heights	John W. Sahlstrom
Endicott	Herbert H. Crumb
Floral Park	Alvah T. Stanforth
Fredonia	Claude R. Dye
Freeport	John W. Dodd
Fulton	George R. Bodley
Garden City	Frank R. Wassung
Geneva	W. L. Housenan
Glen Cove	H. H. Chapman
Glens Falls	A. W. Miller
Gloversville	H. W. Langworthy
Harrison	L. M. Klein
Hastings-on-Hudson	John L. Hopkins
Haverstraw	Aloysius J. Lynch
Hempstead	William A. Gore
Herkimer	Loraine W. Bills
Hornell	Harrison S. Dodge
Hudson	M. C. Smith
Hudson Falls	David R. Finley
Huntington	Raymond C. Burdick
Ilion	Earl P. Watkin
Ithaca	C. L. Kulp
Jamestown	George A. Persell
Johnson City	H. B. Eccleston
Johnstown	E. L. Ackley
Kenmore	F. C. Densberger
Kingston	B. C. Van Ingen
Lackawanna	Clarence A. Conway
Lancaster	Frank L. Smith
Little Falls	Harold L. Corzett
Lockport	R. B. Kelley
Long Beach	Walter J. Schwalje
Lynbrook	C. D. Vosburgh
Malone	Horace H. Lamberton
Mamaroneck	Arthur Z. Boothby
Massena	Carl V. Warren
Mechanicville	John N. Hayes
Medina	A. E. Trippensee
Middletown	E. H. Burdick
Mineola	Harlan B. Allen
Mount Kisco	H. M. Jennings
Mount Vernon	William H. Holmes
Newark	Edwin R. Woelfel
Newburgh	Marion W. Longman
New Rochelle	Herold C. Hunt
New York	Harold G. Campbell
Niagara Falls	James F. Taylor
North Tarrytown	Delbert O. Fuller
North Tonawanda	Claude L. Moss
Norwich	Edwin R. Van Kleeck
Nyack	K. R. MacCalman
Ogdensburg	Arthur J. Laidlaw
Olean	W. C. Greenawalt
Oneida	Albert H. Covell
Oneonta	George J. Dann
Ossining	Harold V. Loomis
Oswego	Frederick Leighton
Oyster Bay	Leon Deming
Patchogue	Sheridan Linn
Peekskill	J. E. Scott
Penn Yan	Clayton E. Rose
Plattsburg	G. M. Elmendorf
Port Chester	Evan E. Jones
Port Jervis	A. H. Naylor
Poughkeepsie	Ward C. Moon
Rensselaer	Walter S. Clark
Rochester	James M. Spinning
Rockville Center	Floyd B. Watson
Rome	George R. Staley
Roslyn	F. R. Wegner
Rye	A. Verne MacCullough
Rye Neck	B. A. Leonard
Salamanca	George A. Place
Saranac Lake	H. V. Littell
Saratoga Springs	Harris Crandall
Scarsdale	Vernon G. Smith
Schenectady	W. H. Pillsbury
Scotia	B. W. Conrad
Seneca Falls	Hubert Mott
Solvay	Claude A. Duvall
Syracuse	G. Carl Alverson
Tarrytown	J. Leroy Thompson
Tonawanda	Earle F. Wingate
Troy	Neil K. White (Lansingburg Dist.) George H. Krug (Union District)

City	Superintendent
Tuckahoe	John C. Goff (Dist. No. 1) Douglas S. MacDonald (Dist. No. 2)
Tupper Lake	R. E. Minnich
Utica	John A. De Camp
Valley Stream	Harry W. Gross
Watertown	C. E. Sabin
Watervliet	William Richmond
Waverly	Donald W. McClelland
Wellsville	George F. Jammer
Whitehall	Page E. Cole
White Plains	H. Claude Hardy
Yonkers	Wm. Ward Ankenbrand
North Carolina	
Asheboro	Reginald Turner
Asheville	R. H. Latham
Burlington	L. E. Spikes
Canton	A. J. Hutchins
Charlotte	H. P. Harding
Concord	A. S. Webb
Durham	W. F. Warren
Elizabeth City	E. E. Bundy
Fayetteville	Horace Sisk
Gastonia	W. P. Grier
Goldsboro	Ray Armstrong
Greensboro	B. L. Smith
Greenville	J. H. Rose
Henderson	E. M. Rollins
Hendersonville	F. M. Waters
Hickory	R. W. Carver
High Point	C. F. Carroll, Jr.
Kings Mountain	B. N. Barnes
Kinston	W. A. Graham
Lenoir	C. S. Warren
Lexington	L. E. Andrews
Monroe	W. R. Kirkman
Mooresville	H. C. Miller
Morganton	W. F. Starnes
Mount Airy	L. B. Pendergraph
New Bern	H. B. Smith
Raleigh	Claude F. Gaddy
Reidsville	L. J. Perry
Rocky Mount	R. M. Wilson
Salisbury	J. H. Knox
Shelby	W. E. Abernathy
Statesville	R. M. Gray
Tarboro	W. A. Mahler
Thomasville	J. N. Hauss
Washington	E. S. Johnson
Wilmington	H. M. Roland
Wilson	K. R. Curtis
Winston-Salem	J. W. Moore
North Dakota	
Bismarck	H. O. Saxvik
Devils Lake	F. H. Gilliland
Dickinson	P. S. Berg
Fargo	H. H. Kirk
Grand Forks	Elroy Schroeder
Jamestown	C. L. Robertson
Mandan	J. C. Gould
Minot	L. A. White
Valley City	G. W. Hanna
Williston	J. N. Urness
Ohio	
Akron	Ralph H. Waterhouse
Alliance	B. F. Stanton
Ashland	J. E. Bohn
Ashtabula	M. S. Mitchell
Athens	Harper C. Pendry
Barberton	U. L. Light
Bedford	A. E. Moody
Bellaire	J. V. Nelson
Bellefontaine	S. A. Frampton
Bellevue	D. H. Patton
Berea	J. F. Koeppe
Bexley	H. C. Dieterich
Bowling Green	Arch B. Conklin
Bucyrus	D. C. Baer
Cambridge	Hugh R. Hick
Campbell	Andrew S. Klinko
Canton	Jesse H. Mason
Chillicothe	M. M. Berry
Cincinnati	C. V. Courter
Circleville	Frank Fischer
Cleveland	Charles H. Lake
Cleveland Heights	Frank L. Wiley
Columbus	Geo. E. Roudebush
Conneaut	C. M. Dickey
Coshocton	A. C. Pence
Cuyahoga Falls	Gilbert Roberts
Dayton	Emerson H. Landis
Defiance	B. M. Lindemuth
Delaware	D. R. Smith
Delphos	E. W. Bell
Dover	C. E. Palmer
East Cleveland	W. H. Kirk
East Liverpool	Herbert G. Means
East Palestine	T. R. Hersh
Elyria	R. C. Maston
Euclid	E. C. Grover
Findlay	F. L. Kinley
Fostoria	H. L. Ford
Fremont	H. H. Church
Galion	O. E. Hill
Gallipolis	E. E. Higgins
Garfield Heights	Harold R. Maurer
Girard	E. O. Trescott
Grandview Heights (Columbus P. O.)	W. C. Rohleder
Greenville	C. L. Bailey
Hamilton	D. R. Baker
Ironton	John A. Miller
Jackson	T. K. Owens
Kent	J. W. Spangler
Kenton	L. E. McKinley
Lakewood	Geo. A. Bowman
Lancaster	C. L. Berry
Lima	J. McLean Reed
Lockland	J. U. Dungan
Logan	G. E. Carr
Lorain	P. C. Bunn
Mansfield	W. L. Miller
Maple Heights (Bedford P. O.)	M. C. Helm
Marietta	H. L. Sullivan
Marion	C. A. Hudson
Martins Ferry	W. L. Kocher
Massillon	L. J. Smith
Miamisburg	Harris V. Bear
Middletown	R. W. Solomon
Mingo Junction	M. L. Dennis
Mount Vernon	A. W. Elliott
Nelsonville	E. J. Arnold
Newark	Paul B. Edwards
New Boston	D. E. Ross
New Philadelphia	H. S. Carroll
Niles	S. J. Bonham
Norwalk	H. C. Ellis
Norwood	Harold S. Bates
Oakwood (Dayton P. O.)	A. E. Claggett
Painesville	C. C. Pierce
Parma	F. S. Shields
Piqua	G. C. Dietrich
Portsmouth	Frank Appel
Ravenna	C. R. Dustin
Reading	H. L. Bussey
Rocky River	J. J. Young
St. Bernard	C. W. Williams
St. Marys	C. C. McBroom
Salem	E. S. Kerr
Sandusky	F. J. Prout
Shaker Heights	Arthur K. Loomis
Shelby	C. G. Keck
Sidney	C. C. Crawford
Springfield	H. L. Stevens
Steubenville	Russell H. Erwine
Struthers	H. E. Zuber
Tiffin	Paul V. Brown
Toledo	E. L. Bowsher
Toronto	S. C. Dennis
Troy	T. E. Hook
Uhrichsville	H. B. Galbraith
Urbana	R. M. Fosnight
Van Wert	U. E. Diener
Wadsworth	Frank H. Close
Wapakoneta	M. R. Menschel
Warren	H. B. Turner
Washington Court House	L. W. Reese
Wellston	H. L. Holter
Wellsville	S. E. Daw
Wilmington	H. W. Hodson
Wooster	C. M. Layton
Xenia	R. J. Warner
Youngstown	Pliny H. Powers
Zanesville	C. T. Prose
Oklahoma	
Ada	C. D. Procter
Altus	A. G. Steele
Alva	H. L. Hensley
Anadarko	R. L. McLean
Ardmore	O. E. Shaw
Bartlesville	H. E. Wrinkle
Blackwell	Harry Hutson
Bristow	E. H. Black
Chickasha	T. T. Montgomery
Clinton	George D. Hann
Cushing	W. B. French
Duncan	N. L. George
Durant	G. T. Stubbs
Elk City	A. M. Keeth
El Reno	Paul R. Taylor
Enid	DeWitt Waller
Guthrie	W. A. Greene
Henryetta	E. E. Battles
Holdenville	Wade H. Shumate
Hugo	Harvey M. Black
Lawton	B. C. Swinney
McAlester	M. J. Hale
Miami	R. C. Nichols
Muskogee	J. R. Holmes
Norman	J. Don Garrison
Oklahoma City	C. K. Reiff
Okmulgee	W. Max Chambers
Pawhuska	Harry E. Moore
Picher	L. R. Pfost
Ponca City	C. P. Howell
Sand Springs	Clyde H. Odell
Sapulpa	E. O. Shaw
Seminole	John G. Mitchell
Shawnee	A. L. Burks
Stillwater	E. D. Price
Tulsa	H. W. Gowans
Wewoka	Harry D. Simmons
Woodward	R. R. Russell
Oregon	
Albany	Frank B. Bennett
Astoria	A. C. Hampton
Baker	Hugh Coleman
Bend	R. E. McCormack
Corvallis	H. W. Adams
Eugene	J. F. Cramer
Klamath Falls	J. P. Wells
La Grande	A. L. Gralapp
Marshfield	Lynn A. Parr
Medford	E. H. Hedrick
Oregon City	J. T. Longfellow
Pendleton	Austin Landreth
Portland	R. E. Dugdale
Salem	Silas Gaiser
The Dalles	Paul R. McCulloch
Pennsylvania	
Abington	Joseph C. Wierick
Aliquippa	Lytle M. Wilson
Allentown	Wm. L. Connor
Altoona	Robert E. Laramy
Ambridge	J. R. Miller
Archbald	John F. Moran
Arnold	H. L. Holste
Ashland	Edward W. Taylor
Ashley	Robert C. Metz
Avalon	S. Todd Perley
Bangor	O. W. Ackerman
Beaver	G. A. McCormick
Beaver Falls	J. Roy Jackson
Bellevue	Harry E. Brumbaugh
Bensalem twp. (Address Cornwells Heights)	Samuel K. Faust
Berwick	M. E. Houck
Bethlehem	J. A. Snyder, Acting
Blairsville	N. Montgomery
Blakely Boro. (Address Peckville)	H. B. Anthony
Bloomsburg	W. W. Evans
Brackenridge	R. R. Anderson
Braddock	W. C. Evans
Bradford	Floyd C. Fretz
Brentwood	J. D. Boydston
Bridgeport	C. C. Smith
Bristol	Warren P. Snyder
Butler	Roy W. Wiley
Canonsburg	F. W. McVay
Carbondale	Mary B. McAndrew
Carlisle	J. W. Potter
Carnegie	Norman L. Glasser
Cecil twp. (Address Canonsburg)	H. S. Kuder

City	Superintendent
Centerville (Address West Brownsville)	C. H. Lyon
Chambersburg	U. L. Gordy
Charleroi	T. L. Pollock
Cheltenham twp. (Address Elkins Park)	Frank C. Ketler
Chester	F. Herman Fritz
Clairton	H. D. Teal
Clearfield	S. F. W. Morrison
Clifton Heights	Chas. A. Brinton
Coaldale	John E. Gildea
Coal twp. (Address Shamokin)	P. F. Brennan
Coatesville	Carl O. Benner
Collingdale	F. E. Stengle
Columbia	J. B. Kennedy
Connellsville	Bela B. Smith
Conshohocken	Robert C. Landis
Coraopolis	J. C. Werner
Corry	Ralph S. Dewey
Crafton	E. O. Liggitt
Danville	E. B. Kline
Darby	W. R. Douthett
Derry twp. (Address Hershey)	J. I. Baugher
Dickson City Boro. (Address Carbondale)	P. M. Brennan
Donora	John E. Shambach
Dormont	David H. Stewart
Du Bois	Herbert E. Reisgen
Dunbar twp. (Address Leisenring)	R. K. Smith
Dunmore	J. R. Gilligan
Dupont	C. T. Dugan
Duquesne	C. H. Wolford
Duryea	J. J. Joyce
Easton	James C. Bay
East Pittsburgh	Charles F. Young
East Stroudsburg	E. E. Kuntz
Edwardsville	V. E. Lewis
Ellwood City	Vaughn R. DeLong
Emaus	H. J. Yeager
Erie	C. Herman Grose
Etna	Clayton L. McMillen
Exeter	John B. Campbell
Farrell	W. W. Irwin
Fell twp. (Address Carbondale)	John H. Campbell
Ford City	Quincey G. Vincent
Forest City	Jules J. Kerl
Forty Fort	Rexford J. Noack
Frackville	Wm. R. Trautman
Franklin	Karl M. Russell
Freeland	N. P. Luckenbill
Gettysburg	L. C. Keefauver
Glassport	John S. Hart
Greensburg	Wm. H. McIlhattan
Greenville	R. D. Welch
Grove City	H. M. B. Lehn
Hanover	C. V. Erdly
Harrisburg	R. R. Abernethy
Haverford twp. (Address Upper Darby)	J. Frank Carter
Hazle twp. (Address Hazleton)	M. W. Garrette
Hazleton	A. D. Thomas
Holidaysburg	Hobson C. Wagner
Homestead	Port Eckles
Honesdale	J. H. Koehler
Huntingdon	J. G. Everard
Indiana	Norman C. Koontz
Jeanette	E. W. Long
Jersey Shore	Charles W. Potter
Johnstown	Dale D. McMaster
Kane	Glennis H. Rickert
Kingston	J. R. Merkel
Kittanning	Clyde W. Cranmer
Kulpmont	J. A. Shovlin
Lancaster	H. E. Gress
Lansdale	Ralph R. Smith
Lansdowne	S. N. Ewan, Jr.
Lansford	E. M. Balsbaugh
Latrobe	John G. Hulton
Lebanon	John W. Hedge
Lehighton	Bert B. David
Lewistown	D. M. Albright
Lock Haven	J. F. Puderbaugh
Lower Merion twp. (Address Ardmore)	S. Edgar Downs
Luzerne	Arthur E. Booth
Mahanoy City	H. S. Bolan
Mahanoy twp. (Address Mahanoy City)	Jas. P. Noonan
Mauch Chunk twp. (Address Nesquehoning)	Clayton W. Wotring
McAdoo	Sallie L. Ferry
McKeesport	James H. Lawson
McKees Rocks	W. H. Church
Meadville	Warren P. Norton
Mechanicsburg	R. L. Van Scoten
Media	Wm. H. Michaels
Middletown	G. W. Feaser
Midland	W. S. Bazard
Millvale	V. C. Holsinger
Milton	Carl L. Millward
Minersville	C. E. Roudabush
Monessen	Wade F. Blackburn
Monongahela	John H. Dorr
Morrisville	M. R. Reiter
Mount Carmel	G. A. Beierschmitt
Mt. Carmel twp. (Address Locust Gap)	P. J. Burke
Mount Lebanon	H. V. Herlinger
Mount Oliver	A. D. Cleland
Mount Pleasant	J. C. Haberlen
Mount Pleasant twp. (Address Mt. Pleasant)	Lloyd F. Rumbaugh
Muhlenberg twp. (Address Temple)	C. E. Cole
Munhall	Charles R. Stone
Nanticoke	A. P. Diffendafer
Nanty-Glo	C. H. Bowers
Nazareth	F. A. Marcks
New Brighton	S. W. Lyons
New Castle	Clyde C. Green
New Kensington	E. T. Chapman
Newport twp. (Address Glen Lyon)	H. U. Nyhart
Norristown	H. O. Dietrich
Northampton	G. A. Eichler
North Braddock	F. D. Zuerner
Oakmont	W. Lee Gilmore
Oil City	R. A. Baum
Old Forge	B. T. Harris
Olyphant	John A. Dempsey
Palmerton	J. N. Roeder
Philadelphia	Edwin C. Broome
Phoenixville	Martin L. Peters
Pitcairn	R. L. Roose
Pittsburgh	Ben G. Graham
Pittston	D. J. Cray
Plains	M. V. Hughes
Plymouth	H. S. Jones
Pottstown	Frank Haiston
Pottsville	L. A. BuDahn
Punxsutawney	F. S. Jackson
Radnor twp. (Address Wayne)	Sydney V. Rowland
Rankin	Frank J. Good
Reading	Thomas Henry Ford
Ridgway	A. C. Nelson
Rochester	Robert P. Barner
Rostraver twp. (Address Belle Vernon)	W. H. Cober
St. Clair	Charles R. Birch
St. Marys	J. J. Lynch
Sayre	Horace H. Beach
Schuylkill Haven	Paul S. Christman
Scottdale	S. B. Bulick
Scranton	John H. Dyer
Sewickley	L. H. Conway
Shamokin	P. E. Whitmeyer
Sharon	W. D. Gamble
Sharpsburg	J. J. Donovan
Sharpsville	Harry E. Pebly
Shenandoah	A. J. Ratchford
South Williamsport	A. B. Elder
Springfield twp. (Address Chestnut Hill)	A. L. Gehman
Steelton	Orris H. Aurand
Stroudsburg	Robert Brown
Summit Hill	E. T. McCready
Sunbury	C. C. Maderia
Swissvale	C. S. Baily
Swoyersville	Henry R. Horvat
Tamaqua	F. G. Horner
Tarentum	A. D. Endsley
Taylor	W. J. Powell
Throop	John J. O'Hara
Titusville	G. A. Stetson
Tredyffrin twp. (Address Berwyn)	Wilmer K. Groff
Turtle Creek	W. W. Lantz
Tyrone	W. W. Eisenhart
Uniontown	J. N. Mowls
Upper Darby	William C. Sampson
Upper Merion twp. (Address Wayne, R. D.)	Lloyd A. Moll
Vandergrift	John R. Kurtz
Warren	J. G. Rossman
Washington	Meyers B. Horner
Waynesboro	D. J. Keener
West Chester	Walter L. Philips
West Hazleton	August Martin
West Mahanoy twp. (Address Lost Creek)	Henry F. Murray
West Pittston	R. J. W. Templin
West View	M. J. Horsch
West York	A. H. Martin
Whitehall twp. (Address Egypt)	William D. Landis
Wilkes-Barre	A. E. Bacon
Wilkinsburg	W. C. Graham
Williamsport	A. M. Weaver
Wilmerding	N. I. Reist
Wilson Boro. (Address Easton)	C. E. Furst
Windber	Joseph L. Hackenberg
Winton Boro. (Address Jessup)	J. L. McCloskey
Yeadon	R. H. Koch, Acting
York	A. M. Ferguson

Rhode Island

Barrington	Charles H. Keyes
Bristol	E. S. Mapes
Burrillville	J. C. Sweeney
Central Falls	James E. Martin
Coventry	R. E. E. Campbell
Cranston	C. W. Bosworth
Cumberland	Bernard F. Norton
East Providence	J. R. D. Oldham
Johnston	Albert A. Thornton
Lincoln	John L. Smith
Newport	Harold T. Lowe
North Providence	James L. McGuire
Pawtucket	Frank A. R. Allen
Providence	A. J. Stoddard
South Kingstown	E. K. Wilcox
Warren	Leroy G. Staples
Warwick	Warren A. Sherman
Westerly	Willard H. Bacon
West Warwick	John F. Deering
Woonsocket	James F. Rockett

South Carolina

Aiken	L. K. Hagood
Anderson	E. C. McCants
Camden	J. G. Richards, Jr.
Charleston	A. B. Rhett
Chester	Myron E. Brockman
Clinton	W. E. Monts
Columbia	A. C. Flora
Darlington	J. C. Daniel
Florence	John W. Moore
Gaffney	L. F. Carson
Georgetown	W. C. Bynum
Greenville	J. L. Mann
Greenwood	W. E. Black
Hartsville	J. H. Thornwell
Laurens	C. K. Wright
Newberry	O. B. Cannon
Orangeburg	A. J. Thackson
Rock Hill	R. C. Burts
Spartanburg	L. W. Jenkins
Sumter	W. F. Loggins
Union	T. C. Jolly, Jr.

City	Superintendent
South Dakota	
Aberdeen	C. L. Dalthorp
Huron	Andrew J. Lang
Lead	R. V. Hunkins
Mitchell	John C. Lindsey
Rapid City	E. B. Bergquist
Sioux Falls	W. I. Early
Watertown	H. Mackenzie
Yankton	C. A. Beaver
Tennessee	
Alcoa	V. F. Goddard
Athens	J. C. Ridenour
Bristol	J. H. Arrants
Chattanooga	W. T. Robinson
Clarksville	C. H. Moore
Cleveland	R. T. Allen
Columbia	R. L. Harris
Dyersburg	C. M. Walker
Elizabethton	L. J. Harrod
Greenville	Mac Alexander
Jackson	C. B. Ijams
Johnson City	Roy G. Biglow
Kingsport	R. N. Robinson
Knoxville	Harry Clark
Memphis	Ernest Ball
Morristown	Carl T. Vance
Murfreesboro	J. C. Mitchell
Nashville	W. A. Bass
Paris	W. O. Inman
Shelbyville	Troy G. Young
Springfield	W. M. Overcash
Union City	T. D. Ozment
Texas	
Abilene	L. E. Dudley
Amarillo	C. M. Rogers
Austin	A. N. McCallum
Beaumont	M. E. Moore
Big Spring	W. C. Blankenship
Bonham	H. A. Glass
Borger	W. A. McIntosh
Breckenridge	N. S. Holland
Brenham	C. M. Selman
Brownsville	E. C. Dodd
Brownwood	E. J. Woodward
Bryan	W. D. Wilkerson
Childress	A. W. Adams
Cisco	R. N. Cluck
Cleburne	Emmett Brown
Coleman	C. H. Hufford
Corpus Christi	M. P. Baker, Acting
Corsicana	W. H. Norwood
Crystal City	S. H. Fly
Dallas	N. R. Crozier
Del Rio	Roy M. Andrews
Denison	B. M. McDaniel
Denton	R. C. Patterson
Eagle Pass	F. R. Thompson
Electra	B. M. Dinsmore
El Paso	A. H. Hughey
Ennis	Newton W. McCann
Fort Worth	W. M. Green
Gainesville	H. O. McCain
Galveston	S. F. Graham
Goose Creek	Harmon Lowman
Greenville	J. L. Bergin
Harlingen	E. C. Deering
Highland Park	H. E. Gable
Hillsboro	Loy W. Hartsfield
Houston	E. E. Oberholtzer
Huntsville	R. M. Hawkins
Jacksonville	Larue Cox
Kingsville	C. E. Wade
Laredo	W. P. Galligan
Longview	Henry L. Foster
Lubbock	W. B. Irvin
Lufkin	I. A. Coston
Luling	R. A. Box
Marlin	H. J. McIlhany
Marshall	Bryan Dickson
McAllen	John H. Gregory
McKinney	Jack R. Ryan
Mercedes	Ernest H. Poteet
Mexia	Frank L. Williams
Midland	W. W. Lackey
Mineral Wells	W. A. Ross
Mission	H. C. Proctor
Nacogdoches	Rufus E. Price
Navasota	J. T. Ferguson
New Braunfels	E. A. Sahm
Orange	W. E. Lowry
Palestine	Bonner Frizzell
Pampa	R. B. Fisher
Paris	A. H. Chamness
Plainview	O. J. Laas
Port Arthur	G. M. Sims
Ranger	W. T. Walton
San Angelo	Felix E. Smith
San Antonio	J. C. Cochran
San Benito	O. L. Davis
San Marcos	Fred Kaderli
Seguin	Joe F. Saegert
Sherman	R. L. Speer
Sour Lake	J. L. Johnson
Sulphur Springs	W. L. Willis
Sweetwater	R. S. Covey
Taylor	E. T. Robbins
Temple	L. C. Procter
Terrell	J. E. Langwith
Texarkana	H. W. Stilwell
Tyler	J. M. Hodges
Uvalde	Guy D. Dean
Vernon	W. T. Lofland
Victoria	P. S. Garner
Waco	R. H. Brister
Waxahachie	T. C. Wilemon
Wichita Falls	H. D. Fillers
Yoakum	G. P. Barron
Utah	
Brigham	Hervin Bunderson (a)
Logan	E. Allen Bateman
Murray	James Clove
Ogden	W. Karl Hopkins
Provo	J. C. Moffitt
Salt Lake City	L. John Nuttall, Jr.
Tooele	P. M. Nielsen (a)
Vermont	
Barre	Wm. H. Carter
Bennington	H. D. Sylvester
Brattleboro	Florence M. Wellman
Burlington	Lyman C. Hunt
Montpelier	W. A. Kincaid
Newport	E. A. Hamilton
Rockingham	Natt B. Burbank
Rutland	W. W. Fairchild
St. Albans	Josiah S. McCann
St. Johnsbury	Frank R. Adams
Springfield	Ernest G. Ham
Winooski	G. R. Stackpole
Virginia	
Alexandria	T. C. Williams
Bristol	B. D. French
Charlottesville	James G. Johnson
Clifton Forge	Herman Blankinship
Covington	A. L. Bennett
Danville	G. L. H. Johnson
Fredericksburg	G. H. Brown
Hampton	Robert M. Newton
Harrisonburg	W. H. Keister
Hopewell	R. W. Copeland
Lynchburg	Omer Carmichael
Martinsville	E. E. Givens (d)
Newport News	J. H. Saunders
Norfolk	C. W. Mason
Petersburg	Henry G. Ellis
Portsmouth	Harry A. Hunt
Pulaski	H. H. Bruce (d)
Radford	A. K. Eagle
Richmond	J. H. Binford
Roanoke	D. E. McQuilkin
South Norfolk	R. H. Pride
Staunton	L. F. Shelburne
Suffolk	John E. Martin
Winchester	G. R. Quarles
Waynesboro	R. C. Jennings
Washington	
Aberdeen	C. J. Powell
Anacortes	De Fore Cramblitt
Bellingham	C. Paine Shangle
Bremerton	Tillman Peterson
Centralia	Paul F. Ferguson
Everett	R. E. Cook
Hoquiam	H. C. Crumpacker
Kelso	C. H. Lillie
Longview	E. J. McNamara
Olympia	L. P. Brown
Port Angeles	F. W. Breakey
Puyallup	P. B. Hanawalt
Seattle	Worth McClure
Spokane	O. C. Pratt
Tacoma	Howard R. Goold
Vancouver	Paul Gaiser
Walla Walla	W. A. Lacey
Wenatchee	W. B. Smith
Yakima	A. C. Davis
West Virginia	
Beckley	E. Van Dorsey (a)
Bluefield (Address Princeton)	C. H. Archer (a)
Charleston	Virgil Flinn (a)
Clarksburg	J. A. Jackson (a)
Elkins	Bryan Hamilton (a)
Fairmont	J. J. Straight (a)
Grafton	E. G. Kuhn (a)
Hinton	Margaret Nicely (a)
Huntington	R. B. Marston (a)
Keyser	Paul C. Rouzer (a)
Martinsburg	G. Wm. Ropp (a)
Morgantown	Floyd B. Cox (a)
Moundsville	Louis R. Potts (a)
Parkersburg	John A. Davis, Jr. (a)
Princeton	C. H. Archer (a)
Richwood	L. O. Bobbitt (a)
South Charleston (Address Charleston)	Virgil Flinn (a)
Welch	George W. Bryson (a)
Wellsburg	Olen Rutan (a)
Weston	Robert T. Crawford (a)
Wheeling	J. P. McHenry (a)
Williamson	C. O. Batson (a)
Wisconsin	
Antigo	P. A. Tipler
Appleton	Ben J. Rohan
Ashland	George A. Bassford
Baraboo	Gordon L. Willson
Beaver Dam	A. H. Luedke
Beloit	D. F. R. Rice
Chippewa Falls	Robert F. Lohrie
Cudahy	J. R. Brandsmark
De Pere	T. J. McGlynn
Eau Claire	Alvin T. Stolen
Fond du Lac	L. P. Goodrich
Fort Atkinson	Frank C. Bray
Green Bay	G. E. Denman
Janesville	V. E. Klontz
Kaukauna	J. F. Cavanaugh
Kenosha	G. F. Loomis
La Crosse	G. M. Wiley
Madison	R. W. Bardwell
Manitowoc	Hugh S. Bonar
Marinette	G. E. Watson
Marshfield	R. F. Lewis
Menasha	F. B. Younger
Menomonie	W. G. Ballentine
Merrill	George F. Brooks
Milwaukee	M. C. Potter
Monroe	E. O. Evans
Neenah	C. F. Hedges
Oconto	L. W. Fulton
Oshkosh	Charles C. Bishop
Portage	A. J. Henkel
Racine	Wm. C. Giese
Rhinelander	W. F. Kruschke
Rice Lake	W. F. Waterpool
Sheboygan	H. E. Smith
Shorewood	H. S. Hemenway
South Milwaukee	John P. Mann
Stevens Point	P. M. Vincent
Superior	W. R. Davies
Two Rivers	Fred G. Bishop
Watertown	R. A. Buell
Waukesha	P. H. Falk
Waupun	H. C. Wegner
Wausau	E. C. Hirsch
Wauwatosa	W. T. Darling
West Allis	H. B. Nash
Whitefish Bay	C. L. Mulrine
Wisconsin Rapids	Floyd Smith
Wyoming	
Casper	Dean Morgan
Cheyenne	A. S. Jessup
Laramie	A. A. Slade
Rock Springs	E. M. Thompson
Sheridan	J. J. Early

References

(a) County superintendent. (b) Parish superintendent.

SECTION XVII
SUPERINTENDENTS OF CATHOLIC PAROCHIAL SCHOOLS

Archdioceses

BALTIMORE, MD.—Rev. John I. Barrett, Diocesan Superintendent of Schools, The Bureau of Catholic Education, 415 Cathedral Street.

BOSTON, MASS.—Rev. Richard J. Quinlan, Diocesan Supervisor of Schools, 75 Union Park Street.

CHICAGO, ILL.—Rev. D. F. Cunningham, Diocesan Superintendent of Schools, 755 N. State Street.

CINCINNATI, OHIO.—Rev. Carl J. Ryan, Superintendent of Parochial Schools, 28 Calhoun Street.

DETROIT, MICH.—Rev. Carroll F. Deady, Diocesan Superintendent of Schools, 1234 Washington Boulevard.

DUBUQUE, IOWA.—Rt. Rev. Msgr. John M. Wolfe, Diocesan Superintendent of Schools, Corner Eleventh and Bluff Streets.

LOS ANGELES, CALIF.—Rev. William North, Diocesan Superintendent of Schools, 714 West Olympic Boulevard.

MILWAUKEE, WIS.—Rev. Edmund J. Goebel, Diocesan Superintendent of Schools, 625 N. Milwaukee Street.

NEW ORLEANS, LA.—Rev. Edward C. J. Prendergast, Archdiocesan Superintendent of Catholic Schools, 7845 Apricot Street.

NEW YORK, N. Y.—Rev. William R. Kelly, Diocesan Superintendent of Schools, 23 East Fifty-first Street.

PHILADELPHIA, PA.—Rt. Rev. Msgr. John J. Bonner, Superintendent of Parochial Schools, 19th and Wood Streets.

PORTLAND, ORE.—Rev. William S. Scandlon, Diocesan Superintendent of Schools, 2053 Southwest Sixth Avenue.

ST. LOUIS, MO.—Rev. James P. Murray, Superintendent of Parish Schools, 2336 University Street.

ST. PAUL, MINN.—Rev. James A. Byrnes, Diocesan Superintendent of Schools, 240 Summit Avenue.

SAN ANTONIO, TEXAS.—President of the School Board, Chancery Office, 230 Dwyer Avenue.

SAN FRANCISCO, CALIF.—Rev. James H. Long, Diocesan Superintendent of Schools, 50 Oak Street.

Dioceses

ALBANY, N. Y.—Rev. James P. Hanrahan, Superintendent of Parish Schools, 695 Fifth Avenue, Watervliet, N. Y.

ALTOONA, PA.—Rev. Francis McNelis, Diocesan Superintendent of Schools, 511 Twentieth Street.

BAKER CITY, ORE.—Rev. John D. Lee, Diocesan Superintendent of Schools.

BELLEVILLE, ILL.—Very Rev. Msgr. John J. Fallon, Diocesan Superintendent of Schools, 6300 West Main Street.

BOISE, IDAHO.—Rev. J. P. O'Toole, Diocesan Superintendent of Schools, 412 State Street.

BROOKLYN, N. Y.—Rt. Rev. Msgr. Joseph V. S. McClancy, Diocesan Superintendent of Schools, 75 Greene Avenue.

BUFFALO, N. Y.—Rev. John W. Peel, Superintendent of Parochial Schools, 793 Elk Street.

BURLINGTON, VT.—Very Rev. W. P. Crosby, President of the School Board, 7 Fullerton Avenue, Montpelier, Vt.

CHARLESTON, S. C.—Rev. Joseph L. O'Brien, Diocesan Superintendent of Schools, 136 St. Philips Street.

CLEVELAND, OHIO.—Rt. Rev. Msgr. John R. Hagan, Diocesan Superintendent of Schools, 605 Guarantee Title Building.

COLUMBUS, OHIO.—Rt. Rev. Msgr. John J. Murphy, Diocesan Superintendent of Schools, 1651 East Main Street.

CONCORDIA, KANS.—Rt. Rev. Msgr. A. J. Luckey, President of the School Board, Manhattan, Kans.

CORPUS CHRISTI, TEXAS.—Rt. Rev. Msgr. J. J. Lannon, Diocesan Superintendent of Schools, St. Patrick's Cathedral.

COVINGTON, KY.—Rev. Alfred Hansen, Diocesan Superintendent of Schools, Holy Family School, Ashland, Ky.

CROOKSTON, MINN.—Rev. Victor Miller, Diocesan Superintendent of Schools, St. Joseph's Church, Ada, Minn.

DALLAS, TEXAS.—Rev. Thomas S. Zachry, Diocesan Superintendent of Schools, 2215 Ross Avenue.

DAVENPORT, IOWA.—Rev. P. J. O'Reilly, Diocesan Superintendent of Schools, St. Patrick's Rectory, Iowa City, Iowa.

DENVER, COLO.—Diocesan School Office, 230 East Seventeenth Avenue.

DES MOINES, IOWA.—Rev. L. V. Lyons, Diocesan Superintendent of Schools, St. Ambrose Cathedral.

DULUTH, MINN.—Rev. John Sholar, Diocesan Superintendent of Schools, 610 Ninety-ninth Avenue.

ERIE, PA.—Rev. Joseph J. Wehrle, Superintendent of Catholic Schools, 225 West Ninth Street.

FALL RIVER, MASS.—Rev. Edward J. Gorman, Superintendent of Diocesan Schools, 162 Walnut Street.

FARGO, N. DAK.—Rt Rev. Msgr. John Baker, Inspector of Schools, Valley City, N. Dak.

FORT WAYNE, IND.—Rev. Thomas E. Dillon, Diocesan Superintendent of Schools, 903 North Jefferson Street, Huntington, Ind.

GALVESTON, TEXAS.—Rt. Rev. Jacob Schnetzer, Diocesan Superintendent of Schools, 4015 Sherman Avenue, Houston, Tex.

GRAND ISLAND, NEBR.—Rev. Bernard Galvin, Diocesan Superintendent of Schools, St. Michael's Church, Spalding, Nebr.

GREAT FALLS, MONT.—Rev. J. A. Rooney, Diocesan Superintendent of Schools, 306 North Montana Street, Butte, Mont.

GREEN BAY, WIS.—Rev. E. J. Westenberger, Superintendent of Catholic Schools, 128 South Monroe Avenue.

HARRISBURG, PA.—Rev. Harold E. Keller, Diocesan Superintendent of Parish Schools, Catholic High School, Twenty-third and Market Streets.

HARTFORD, CONN.—Rev. Austin Munich, Diocesan Supervisor of Schools, St. Thomas Seminary, Bloomfield, Conn.

HELENA, MONT.—Rev. J. A. Rooney, Diocesan Superintendent of Schools, 306 North Montana Street, Butte, Mont.

INDIANAPOLIS, IND.—Rev. Leonard Wernsing, Diocesan Superintendent of Schools, 144 West Georgia Street.

KANSAS CITY, MO.—John J. Murphy, Superintendent of Schools, 309 Benton Boulevard.

LA CROSSE, WIS.—Rev. Lester W. Seemann, Diocesan Superintendent of Schools, Twenty-fourth and Cass Streets.

LAFAYETTE, LA.—Very Rev. Anthony F. Canon Isenberg, Diocesan Superintendent of Schools, The Cathedral.

LEAVENWORTH, KANS.—Rt. Rev. Msgr. J. P. McInerney, President of the School Board, 204 West Eighth Street, Topeka, Kans.

LINCOLN, NEBR.—Very Rev. Msgr. L. V. Barnes, Diocesan Superintendent of Schools, 514 South Eighteenth Street.

LITTLE ROCK, ARK.—Rt. Rev. Msgr. John J. Healy, Diocesan Superintendent of Schools, Little Rock College.

LOUISVILLE, KY.—Rev. Felix N. Pitt, Diocesan Superintendent of Schools, 443 South Fifth Street.

MANCHESTER, N. H.—Rev. William P. Clancy, Diocesan Superintendent of Schools, Mount St. Mary's Academy, Hooksett, N. H.

MARQUETTE, MICH.—Rev. Martin Melican, Superintendent of Parochial Schools, 311 Baraga Avenue.

MOBILE, ALA.—Rt. Rev. L. J. Carroll, Superintendent of Parochial Schools, Bishop Toolen High School, 400 Government Street.

MONTEREY and FRESNO, CALIF.—Rev. James Dowling, Diocesan Superintendent of Schools, Fresno.

NASHVILLE, TENN.—Rev. George J. Flanigan, Diocesan Superintendent of Schools, 328 Fifth Avenue, N.

NEWARK, N. J.—Very Rev. Msgr. William F. Lawlor, Diocesan Superintendent of Schools, 31 Mulberry Street.

OGDENSBURG, N. Y.—Rev. John M. Hogan, Diocesan Superintendent of Schools, Wadhams Hall.

OKLAHOMA CITY and TULSA, OKLA.—Bishop's Secretary, Chancery Office, 1000 North Lee Avenue, Oklahoma City.

OMAHA, NEBR.—Rev. Joseph H. Ostdiek, Diocesan Superintendent of Schools, 2507 Cass Street.

PEORIA, ILL.—Rev. M. J. Haddigan, Diocesan Superintendent of Schools, 405 Smith Street.

PITTSBURGH, PA.—Rev. Paul E. Campbell, Diocesan Superintendent of Schools, 5325 Penn Avenue.

PORTLAND, MAINE.—Rev. John J. Barrett, Diocesan Superintendent of Schools, 307 Congress Street.

PROVIDENCE, R. I.—Rev. Thomas V. Cassidy, Diocesan Superintendent of Parochial Schools, 20 Regent Avenue.

RALEIGH, N. C.—Rev. Michael J. Begley, Diocesan Superintendent of Schools, 609 Barbee Street, High Point, N. C.

RAPID CITY, S. DAK.—Most Rev. John J. Lawler, President of the School Board, 1622 West Boulevard.

RICHMOND, VA.—Rev. Francis J. Byrne, Diocesan Superintendent of Schools, 811 Cathedral Place.

ROCHESTER, N. Y.—Rev. John M. Duffy, Diocesan Superintendent of Schools, 50 Chestnut Street.

ROCKFORD, ILL.—Rev. William J. Donovan, Diocesan Superintendent of Schools, 95 East Wilson Street, Batavia, Ill.

SACRAMENTO, CALIF.—Rev. Raymond Renwald, Diocesan Superintendent of Schools, Box 1706.

ST. CLOUD, MINN.—Rev. T. Leo Keaveny, Diocesan Superintendent of Schools, Cathedral Rectory, 316 Seventh Avenue, North.

SALT LAKE CITY, UTAH.—Rev. Joseph S. Keefe, Diocesan Superintendent of Schools, 650 South Eleventh East Street.

SAN DIEGO, CALIF.—

SAVANNAH, GA.—Rt. Rev. Msgr. Joseph F. Croke, Diocesan Superintendent of Schools, 222 East Harris Street.

SCRANTON, PA.—Rev. J. J. Featherstone, Diocesan Superintendent of Schools, 315 Wyoming Avenue.

SIOUX CITY, IOWA.—Rev. C. Ivis, Diocesan Superintendent of Schools, St. Anthony's Home.

SIOUX FALLS, S. DAK.—Rt. Rev. Msgr. W. S. O'Meara, Diocesan Superintendent of Schools, Watertown, S. Dak.

SPRINGFIELD, ILL.—Rev. George M. Link, Diocesan Superintendent of Schools, 524 East Lawrence Avenue.

SPRINGFIELD, MASS.—Rev. John R. Rooney, Diocesan School Visitor, Chicopee Falls, Mass.

SUPERIOR, WIS.—Rev. Joseph Annabring, Diocesan Superintendent of Schools, 1201 Hughitt Avenue.

SYRACUSE, N. Y.—Rev. David C. Gildea, Diocesan Superintendent of Schools, 257 East Onondaga Street.

TOLEDO, OHIO.—Rev. Norbert M. Shumaker, Diocesan Superintendent of Catholic Schools, 807 Superior Street.

TRENTON, N. J.—Rev. Michael A. Dalton, Diocesan Superintendent of Schools, 312 North Pearl Street, Bridgeton, N. J.

WHEELING, W. VA.—Rev. John J. O'Brien, Superintendent of Diocesan Schools, 464 Washington Avenue, Clarksburg, W. Va.

WICHITA, KANS.—Rev. Leon A. McNeill, Diocesan Superintendent of Schools, 307 East Central Avenue.

WILMINGTON, DEL.—Rev. Leo W. O'Neill, Diocesan Superintendent of Schools, 809 South Broom Street.

SECTION XVIII
AIDS AVAILABLE TO LOCAL SCHOOL BOARDS FROM STATE DEPARTMENTS

PARTICIPATION OF STATE AGENCIES IN PLANNING AND SUPERVISING LOCAL SCHOOL-BUILDING DEVELOPMENT

IN the planning of buildings for a public school system, it frequently is desirable to know the degree to which the state board of education has provided for participation and cooperation. The following summary segregates the character of the supervision given by the state and its representative agencies under three headings. The first item indicates the action which the state board may be expected to take. The second item shows the part played by the state superintendent of schools as the official spokesman for the state department of education. In the third part will be found indications of the assistance or guidance which other state agencies will give. The form of tabulation has necessitated very brief statements covering these responsibilities, but the degree and character of participation are clearly shown for each state. The list has been revised up to December, 1937.

THE STATES' PARTICIPATION IN SCHOOL-BUILDING CONSTRUCTION

Alabama

State Board of Education, Montgomery
Approves rules and regulations submitted by state superintendent.
State Superintendent of Education, A. H. Collins
Prepares and submits to the state board of education rules and regulations pertaining to: minimum standards for school sites; minimum standards for plans, specifications, and construction of school buildings; for the issuance of warrants for capital outlay purposes.
Schoolhouse planning is a service in the division of administration and finance. In addition to the preparation of rules and regulations as listed above, the following services are rendered:
Plans and specifications are prepared for rural school building construction.
Plans and specifications prepared by private architects are approved.
Buildings in process of construction are inspected upon request to determine whether plans and specifications are being followed.
Rules and regulations of the state board are administered to insure the proper execution.
School surveys are carried on to provide the data for school building programs.
Each county is required to submit annually a building and capital outlay program which must be approved before actual work on the program is undertaken.
Director of the Division of Administration and Finance, R. L. Johns, Acting
Supervisor of Schoolhouse Planning, R. E. Ledbetter
Architect, Clyde C. Pearson

Arizona

State Board of Education, Phoenix
No jurisdiction whatever in regard to buildings erected by districts.
State Superintendent of Public Instruction, H. E. Hendrix
No jurisdiction.
Other Agencies
Board of health issues regulations.

Arkansas

State Board of Education, Little Rock
Has a division of school grounds and schoolhouse planning.
Director prepares plans for 1- to 7-teacher buildings, and for such buildings as teachers' homes, shops, home economics buildings, gymnasiums, etc.
Furnishes preliminary sketches of floor plans for larger buildings.
Checks architects' plans for school buildings upon request.
Advises school officials as to plans for remodeling, repairing and altering school buildings.
Advises superintendents and teachers as to interior arrangements, furniture and equipment.
Superintends the construction of all school buildings during progress of erection, except when the district employs an architect.
State Commissioner, W. E. Phipps
No legal provision for approval.
Director, School Plant Division, J. Odell Baker

California

State Superintendent of Public Instruction, Walter F. Dexter, Sacramento
Division of schoolhouse planning passes on all plans costing more than $5,000, excepting those in the largest cities; is called into consultation by city districts, and controls other situations by surveys.
Site sizes and locations controlled by state standards.
No building contract, in situations coming under the department's jurisdiction, is legal without the required approval.
This department does not make working drawings.
Chief of Division of Schoolhouse Planning, Dr. Charles W. Bursch

Colorado

State Superintendent of Public Instruction, Mrs. Inez Johnson Lewis, Denver
School building handled by local boards of education.

Connecticut

State Board of Education, Hartford
Has a section of buildings and plans which approves plans for enlargement and new construction. It inspects school buildings for safety.
Publishes standards for guidance of local boards.
Has architect to whom plans are referred.
Assists local communities in building surveys.
State Commissioner, E. W. Butterfield
Assistant Supervisor of Buildings and Plans, John E. Nichols

Delaware

State Board of Education, Dover
Outside Wilmington prepares a tentative program of school building to submit to local boards.
Hears comments and suggestions thereon.
Creates standards with effect of law, governing hygienic, sanitary, and protective construction; selection, arrangement, and maintenance of sites; condemns school buildings.
Has approval of plans and specifications.
State Superintendent of Public Instruction, Dr. H. V. Holloway

Other Agencies
Legislature has created a state school-building act.
There is a state school-building account.
State school-building commission for each district.
Plans approved by state board of education and commission.
Buildings built by commission.
Construction supervised by commission.
Board of health has to approve drinking water and sewage disposal.

Florida

State Superintendent of Public Instruction, Colin English, Tallahassee
Has oversight, charge, and management of all matters pertaining to public schools, school buildings and grounds.
The state department renders the following services:
1. In cooperation with county boards of public instruction, carries on surveys to determine where elementary and secondary school centers should be located, the steps that should be taken in carrying out the building program, and the means of financing the building program.
2. All capital outlay projects are submitted along with the annual school budget. Advice is rendered in connection with these proposals.
3. All plans for school buildings to be constructed are submitted to the department for approval. When necessary, recommendations are given relating to desirable improvements in the plans.
4. Plans are prepared for some of the buildings where architectural services are not available. Consultative and advisory services relating to the letting of contracts and other problems involved in the planning and construction of school buildings are provided through this department.

Director of Administration and Finance, Edgar L. Morphet, Tallahassee
Has direction of Division, which includes work in surveys, transportation, school plant planning, and architectural surveys.
School Plant Planning Service, J. L. Graham
School Architect, James A. Stripling
School Surveys and Transportation, Paul Eddy

Georgia

State Superintendent of Schools, Dr. M. D. Collins, Atlanta
Furnishes plans and specifications for school-building guidance in local units.
Supervisor of schoolhouse construction prepares plans for 1- to 6-teacher buildings; prepares school ground plans; checks architects' plans; advises school officials.
Other Agencies
County superintendent and county board of education approve plans.

Idaho

State Board of Education, Boise
Standardization of:
Sanitary appliances
School furniture
School equipment and supplies
School buildings
Issues plans for 1-, 2-, 3-room buildings.
Requires approval of all plans.
State Superintendent, J. W. Condie
Member of state board of education and its executive officer.
Other Agencies
Department of public welfare has to cooperate with state board of education in its duties regarding schools.
County superintendent has power to require local trustees to conform to rules of state board "if there is money enough."
County board of health is responsible for sanitation in schools.

Illinois

State Superintendent of Public Instruction, John A. Wieland, Springfield
Prepares, with advice of state board of health, state architect, and state fire marshal, specifications for minimum requirements in heating, ventilation, lighting, seating, water supply, toilets, safety against fire.
These have force of law.
Other Agencies
State architect is required to assist the state superintendent of schools.
Enforcement of law is in the hands of county superintendents and local authorities.
County superintendent advises school officials in details of construction, but only on standards is it necessary to follow him.
County superintendent inspects buildings.
Board of directors and board of education required to submit plans to county superintendent.

Indiana

State Superintendent of Public Instruction, Floyd I. McMurray, Indianapolis
Other Agencies
Local school trustees erect buildings. Plans and specifications must be submitted to state board of health for approval of sanitation and hygiene; to state board of accounts for adequacy of specifications and fair competition; and to state fire marshal for compliance with state fire laws.
State board of health issues standards.

Iowa

State Superintendent of Public Instruction, Agnes Samuelson, Des Moines
Shall prepare and publish, when deemed necessary, a pamphlet containing suitable plans and specifications.

Kansas

State Board of Education, Topeka
"No provision in the laws to prevent the erection of undesirable buildings or to compel the discontinuance of buildings that should be abolished immediately, further than plans for all new school buildings must be submitted to the state architect as to provision for fire protection according to law." Section 367, Revised School Laws of Kansas for 1937.
Has adopted standardization of rural schools involving among other things: out-building; school-building equipment; and the school building itself.
State Superintendent of Public Instruction, W. T. Markham
Criticizes and approves plans submitted voluntarily by local authorities.
State Architect, Thomas Nall

Kentucky

State Board of Education, Frankfort
Authorized to approve and adopt regulations for the sanitary and protective construction of public school buildings.
State Superintendent of Public Instruction, H. W. Peters
With concurrence of state board of health prepares regulations for the sanitary and protective construction of public school buildings. Prepares plans and specifications for 1- to 4-teacher public school buildings, for adoption by the state board of education. Examines and approves or disapproves plans and specifications submitted by county boards of education and graded boards of education.
Director of School Buildings and Grounds, J. W. Brooker

Louisiana

State Superintendent of Public Education, T. H. Harris, Baton Rouge
The state law requires approval of all school plans by the state superintendent. Plans must be drawn by licensed school architects.
Other Agencies
The state law requires that the school plans shall be approved by the state board of health, fire marshal, and parish school board.

Maine

State Commissioner of Education, Bertram E. Packard, Augusta
No school building can be built or repaired without his approval, where the expenditure is in excess of $500.
Provides plans for 1- to 4-room buildings free of cost.
Issues minimum requirements so that local units will be able to meet his approval of plans.
Other Agencies
No school building can be built or repaired without approval of board of health, where the expenditure is in excess of $500.

Maryland

State Board of Education, Baltimore
Elementary schools. Standardization includes grounds, buildings, lighting, heating and ventilation, library, equipment.
Has issued "Standards for School Buildings" as a guide to county superintendents.
State Superintendent of Schools, Dr. Albert S. Cook
Sites and plans must be submitted to him for approval, additions to buildings also.

After plans have been approved by the state consultant architect, the state superintendent issues certificate without which no building costing $300 or more can be erected (Sec. 30, Article 77, Annotated Code of Maryland).

Other Agencies

Plans must be submitted to state board of health for approval of sewage-disposal arrangements and plumbing.

Massachusetts

State Commissioner of Education, James G. Reardon, Boston

Assistants of superintendent do much in consulting with local committees. Loan slides.

Other Agencies

Department of public safety must approve all plans.

Department of public safety issues regulations.

Director of Buildings' Inspection Division, Department of Public Safety, J. J. Carey, State House, Boston

Michigan

State Department of Public Instruction, Lansing

Provides consultation to boards of education and school administrators regarding surveys, legal procedures, finance, and educational designing.

Assists in planning and executing building program, upon invitation.

State Superintendent, Eugene B. Elliott

Other Agencies

State fire marshal cooperates for elimination of fire hazards.

State department of health cooperates for provision of proper sanitation.

Public debt commission assists in problems of debt service.

Minnesota

State Board of Education, St. Paul

Prints and distributes laws and rules governing public school buildings and sites.

Supplies inspection service and advises local school officials relative to school building problems in heating, ventilation, illumination, alteration, operation, maintenance, and financing.

Assists architects and public school officials in functional planning of school buildings.

Prepares and supplies gratis to school boards plans and specifications for one and two room school houses.

State Commissioner, John Gundersen Rockwell

Examines all plans and specifications with power of approval or otherwise.

Prescribes rules for schoolhouse construction, including therein rules of the board of health relative to sanitary standards for toilets, water-supply, and disposal of sewage.

He may condemn buildings under his own or the state board of education's rules.

Other Agencies

Division of sanitation, state board of health, examines and approves all school-building plans relative to water supply, sewage disposal and plumbing systems.

The law authorizes county superintendent to advise rural school boards in regard to buildings, ventilation, and school grounds.

Director, Division of Buildings and Business Administration, I. O. Friswold

Mississippi

State Department of Education, Jackson

Has a division of school building service. This division:

Cooperates in making surveys on the effective organization of schools.

Makes surveys to determine building needs.

Outlines building programs.

Approves architects' plans and specifications for school buildings.

Furnishes free plans and specifications for some small school buildings, teachers' homes and accessory buildings.

General advisory service on school-plant planning and equipment and on the effective use of the school plant.

State Superintendent, J. S. Vandiver

School Building Service, W. G. Eckles, State Director

Missouri

State Superintendent of Education, Jefferson City

Has prepared "Standards for Schoolhouse Planning and Construction," makes surveys of building needs, prepares and distributes plans and specifications for small buildings, aids in setting up requirements before plans are drawn for larger buildings, checks and approves all plans and specifications, maintains an advisory service on school-building insurance, school-building maintenance, including janitorial training service.

State Superintendent of Public Schools, Lloyd W. King

Other Agencies

The State Department of Public Health aids in checking the water supply.

Director of School Building Service, N. E. Viles

Montana

State Board of Education, Helena

Publishes a bulletin containing a list of standards for rating 1- and 2-room schools.

State Superintendent of Public Instruction, Ruth Reardon

Plans are furnished local boards by the board of health.

Nebraska

State Superintendent of Public Instruction, Charles W. Taylor, Lincoln

Advises with school authorities regarding building programs when officials request conferences. The state department does not maintain technically trained people for this service, and Nebraska has no law requiring construction according to specifications.

Nevada

State Department of Education, Carson City

Must prepare plans and specifications for rural schoolhouses on standard lines of school architecture as to size, lighting, heating, ventilation and general sanitation. The trustees of rural schools needing new schoolhouses shall be supplied with such plans and specifications upon request.

No public schoolhouse may be erected in any school district until the plans have been approved by the deputy superintendent of public instruction.

State Superintendent of Public Instruction, Chauncey W. Smith

New Hampshire

State Board of Education, Concord

State Commissioner, James N. Pringle

Interprets meaning of "suitable and sanitary" buildings for all schools. Has general authority to make regulations. Cooperates with superintendents and local school boards in planning buildings.

Recommends to state board of health investigation of unsuitable buildings.

Administrative Field Agent, Paul E. Farnum

Other Agencies

State board of health, on complaint, may condemn or order buildings improved at expense of districts.

New Jersey

State Board of Education, Trenton

Advice and consent to appointment of building inspector by commissioner of education.

Approves plans and specifications for all schoolhouse construction.

Has set up a school building code.

State Commissioner of Education, Dr. Charles H. Elliott

Appoints an inspector of school buildings, with advice and consent of state board of education.

May instruct county and city superintendents as to constructing schoolhouses and furnishing them.

Assistant Commissioner of Education, Charles D. Anderson

Supervisor and director of school finance, accounting, attendance and school buildings.

Inspector of School Buildings, Seymour Williams

Recommends approval of plans and specifications for schoolhouse construction.

Inspects all new construction and old buildings.

Advises local school officials on school building needs.

Assists in school building surveys.

Other Agencies

County superintendent has power "to note" conditions of schoolhouses, sites, etc., and advise with local boards in respect to construction, heating and ventilation, and lighting. May, with consent of commissioner of education, cause state moneys to be withheld where facilities are not in accord with legal requirements.

Local boards provide school buildings.

New Mexico

State Superintendent of Public Instruction, H. R. Rodgers, Santa Fe

New York

State Education Department, Albany
Has a division of school buildings and grounds with a director.
Has set up standards.
Board issues a pamphlet of information for local authorities.
Makes inspections of sites and school conditions before definite action is taken by local authority.
Advises with superintendents, principals, and boards in regard to needs and best way to meet them.
Examines preliminary plans.
State Commissioner, Dr. Frank P. Graves
All plans and specifications must receive the commissioner's approval in all districts other than first and second class cities.
He cannot approve unless plans conform to laws.
No tax can be levied until plans are approved.
Director of School Buildings and Grounds Division, Warren W. Day

North Carolina

State Board of Education, Raleigh
Has a division of schoolhouse planning.
There is a Literary Loan Fund from which loans are made when plans are approved.
Suggestions for planning school plants are distributed from time to time by state department of public instruction.
Has plans for one-story schools and gymnasiums which are distributed free by director of schoolhouse planning.
State Superintendent of Public Instruction, Clyde A. Erwin
Law requires that all plans be approved by state superintendent of public instruction.
Other Agencies
State insurance commissioner for fire safety, and state board of health for sanitary facilities.
Director, Division of Schoolhouse Planning, W. F. Credle

North Dakota

State Superintendent of Public Instruction, Arthur E. Thompson, Bismarck
Plans must be submitted to and approved by superintendent.

Ohio

State Director of Education, E. N. Dietrich, Columbus
Other Agencies
Has a state building code (very elaborate).
All plans must be approved by chief inspector of workshops and factories, except in cities having regularly organized building inspection departments.
District health commissioner checks plans for water-supply and sanitary arrangements. State department of health may make surveys and issue orders as to these matters.

Oklahoma

State Superintendent of Public Instruction, A. L. Crable, Oklahoma City
Prepares complete plans and specifications when requested for the construction of school buildings for four teachers or less, costing less than $10,000.
Makes school-building survey for all sizes of buildings.
Approves plans of all sizes but approval is not required by law.
Other Agencies
Standard building laws.
Book of 300 plans in hands of each county superintendent in the state.
Director of Schoolhouse Planning, Frank Williams

Oregon

State Superintendent of Public Instruction, Rex Putnam, Salem
Manual on "The Construction and Care of School Buildings" issued to all school districts. No legal provision for the approval of the state department, but an advisory service is maintained.
Other Agencies
Plans for schools in third-class districts must be approved by county school superintendents.
County superintendents advise with the school boards relative to the construction, warming, ventilating, and arrangement of schoolhouses.

Pennsylvania

State Department of Public Instruction, Harrisburg
Has a division of school buildings.
Prescribes rules and regulations and has power to take such action as it may deem expedient to promote physical and moral welfare of school children.
Department code—
Required to approve plans in 2nd, 3rd, 4th class districts.
Supervises preparation of plans in local communities.
Submits suggestive sketches.
State Superintendent of Public Instruction, Dr. Lester K. Ade
Other Agencies
State code.
Art commission passes on architectural design.
Department of labor and industry passes on fire and panic protection.
Chief, Division of School Plant, Dr. HuBert C. Eicher

Rhode Island

State Director of Education, James F. Rockett, Providence
Part of the income of the permanent school fund may be apportioned by the director of education to assist towns in constructing model school buildings.

South Carolina

State Superintendent of Education, Dr. James H. Hope, Columbia
Division of schoolhouse planning and construction. Plans must be submitted to and approved by the director of schoolhouse planning.
The director inspects all plans and new buildings, and a certificate of approval is necessary before they can be used.
Plans and specifications and supervision of construction are furnished to small schools not employing an architect.
Other Agencies
Has a state building code.
Director of Schoolhouse Planning, S. P. Clemons

South Dakota

State Superintendent of Public Instruction, J. F. Hines, Pierre
Plans must be approved by him, and show heating and ventilation scheme. He assists in an advisory capacity in the planning of school buildings; he also helps boards in various ways to show their communities the needs of new buildings and additions to buildings.

Tennessee

State Commissioner of Education, W. A. Bass, Nashville
Division of schoolhouse planning furnishes working drawings and specifications for buildings up to and including four-teacher buildings. The division offers functional planning advice, and checks plans for larger buildings, where such service is requested.
State Director of Schoolhouse Planning, L. P. Pitts

Texas

State Board of Education, Austin
Purchases school district bonds or grants waiver for district to sell in open market.
State Superintendent, L. A. Woods
Administrative officer of public school laws and ex officio secretary of the state board, receives reports required by statute and is general superintendent of business relating to the public schools.
Other Agencies
School-building code.
Plans must be submitted as follows for approval: (1) in a common school district—to the county superintendent; (2) independent district and city or town—to superintendent of schools.
These agencies report to state department what they have done and transmit evidence.
State Director of School Plant Division, J. Fred Horn
Prepares plans for 1- to 6-teacher buildings, and suggestive sketches for larger buildings; advises school officials; checks architects' plans; makes school-building surveys upon invitation; visits local units upon invitation.

Utah

State Board of Education, Salt Lake City
There are two department building codes.
First is in abeyance though not exactly discarded.
They have operated under the second one 5 years.
State Superintendent of Public Instruction, C. H. Skidmore
Is required to formulate a code to govern preparation of plans by local communities.
Is required to approve all building plans.
May hire an architect to examine plans or inspect buildings.

Vermont

State Board of Education, Montpelier
Public school buildings are standardized with "points" on buildings, grounds, equipment.
Plans "should be" submitted to state board.
Issues plans, pictures and bulletins.
State Commissioner, Francis L. Bailey
Other Agencies
Plans "must be" submitted to board of health.

Virginia

State Board of Education, Richmond
Has a division of school buildings.
Prepares plans and specifications for smaller towns and cities.
Supervises construction free of charge.
Minimum standards have been set up and approved.
Cooperates with local boards in:
(a) Preparing preliminary plans.
(b) Getting out final plans.
(c) Attendance at opening of proposals.
(d) Inspection every 2 weeks during construction, additional upon request of contractor or local board.
State Superintendent of Public Instruction, Dr. Sidney B. Hall
State Director, Division of Buildings, Raymond V. Long

Washington

State Superintendent of Public Instruction, Olympia
Has been given "some power" through law on "wider use of school plant."
State Superintendent of Public Instruction, Stanley F. Atwood
Other Agencies
County superintendents approve plans in 3rd class districts.

West Virginia

State Board of Education, Charleston
May require all plans and specifications for the erection of school buildings to comply with the requirements of law; and may require all county boards to submit all plans and specifications for the state board's approval.
State Superintendent of Free Schools, W. W. Trent

Wisconsin

State Department of Public Instruction, Madison
Under a cooperative agreement between the industrial commission and the department, all school plans are sent to the latter by the commission for checking and suggestive criticisms looking towards the erection of first class buildings.
Helps local communities by suggesting plans for all types of buildings to serve as a basis for extended work by commercial architects.
Service has been extended to cover expert advice on heating, ventilation, lighting.
The department develops complete plans and specifications and gives architectural service for 1- and 2-room rural schools on request.
Inspects all types of schools with a view to improving housing conditions and facilities; makes complete building surveys in all types of communities on request.
Gives field service and makes inspection upon request.
State Superintendent of Public Instruction, John Callahan
Other Agencies
The law requires submission of all school plans to industrial commission. This checking refers primarily to the application of the state building code and pays attention primarily to construction, safety and sanitation.
Supervisor of Buildings, H. W. Schmidt

Wyoming

State Superintendent of Public Instruction, Jack R. Gage, Cheyenne
Entrusted with general supervision of the public schools of the state. The commissioner of education works under his direction.
Commissioner of Education, R. L. Markley
He shall prepare for the use and guidance of the district board regulations and suggestions for standardizing and grading schools and for the hygienic and sanitary building of schoolhouses and the selection of sites.

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2nd Grade
3rd Grade
4th Grade
5th Grade
6th Grade
7th Grade
8th Grade
1st-2nd Grades
2nd-3rd Grades
3rd-4th Grades
4th-5th Grades
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Auditorium
Auditorium-Balcony
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Balcony
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Basal Met. Room
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Board of Education
Boiler Room
Boiler Rooms
Book Room
Book Store
Bookkeeping Room
Botany
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Boys→
←Boys
Boys' Cloak Room
Boys' Dressing Room
Boys' Gymnasium
Boys' Locker Room
Boys' Rest Room
Boys' Shower
Boys' Toilet
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Business Office
Cafeteria
Chapel
Chemistry
Check Room
Chief Engineer
Choir Room
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Danger
Dean
Dean of College
Dean of Men
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Engine Room
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Exit→
←Exit
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Fire Escape
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French
Freshmen
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Gallery
General Science
Geometry
Geography
German
Girls
Girls→
←Girls
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Girls' Dressing Room
Girls' Gymnasium
Girls' Locker Room
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Girls' Toilet
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Lady Teachers
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Music Supervisor
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←Office
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